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MONTANA AIR QUALITY DATA & INFORMATION SUMMARY FOR 1987

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MONTANA AIR QUALITY DATA AND INFORMATION SUMMARY FOR 1987

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April, 1989

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Introduction

The purpose of the Montana Air Quality Data and Information Summary for 1987 is to summarize air quality data collected within the state and to provide information on air quality topics.

With the adoption of the Clean Air Act, EPA divided the state into five geographical regions. Each of these Air Quality Control Regions (AQCRs) contains distinct meteorological patterns, topography and industrial influences. This report addresses the monitoring activities by AQCR. Within each region, various background information is provided. This includes: location of the AQCR, physical features, population, types of pollution sources, monitoring site descriptions, summaries of the air quality data, and the number of data values exceeding the federal and Montana ambient standards.

The air quality data summaries have been tabulated to show the following: site code, site name, year of record, month, number of

observations, first, second and third maxima, arithmetic mean, three-hour maximum (SO_2), eight-hour maximum (CO), 24-hour maximum (SO_2), geometric mean (TSP), and weighted annual average (PM-10).

The data collected by the Air Quality Bureau undergoes various quality assurance (QA) procedures to validate the readings. Each level within the chain of custody is audited for compliance with EPA's prescribed guidelines. This includes operating procedures, equipment performance, laboratory methods, data validity and data processing. It is due partly to these QA procedures that there is a time lag involved in obtaining reports of air quality data.

In south central Montana (AQCR 140), the major air pollution problem continues to involve SO_2 in the Billings area. Contributing sources include a coal-fired power plant and three oil refineries. There were no violations of the federal standards in 1987.

During the legislative session of 1987, the Montana SO_2 standards were rescinded for the Billings/Laurel area in response to lobbying efforts of various local groups. This area had seen violations of the more stringent Montana standards in the past but has managed to stay within the federal limits.

A committee of Billings industry representatives, Chamber of Commerce, and air pollution professionals was formed to monitor and report on the air quality of the area. The aim of the committee was also to arrive at some solutions to the air pollution problems of Billings and Laurel. The committee meets once a month in Billings.

In north central Montana (AQCR 141), the pollutant of concern is carbon monoxide in Great Falls. There were four violations of the Montana and federal 8-hour standards for CO in 1987, mostly due to a combination of automobile emissions and stagnant weather conditions.

In southwest Montana (AQCR 142), the major air pollution problems involve particulate matter and lead. High concentrations of lead at three sites in the East Helena area resulted in eleven violations of the federal calendar quarter standard. Lead concentrations remain high despite numerous control measures instituted at the primary lead smelter over the past several years. Winter quarters continue to show the highest concentrations and are most resistant to the control strategies. PM-10 was monitored in Bozeman, Helena, Butte and Ovando. The highest readings occurred at the Butte Greeley School site which had several violations of the 24-hour standard and exceeded the annual average.

In eastern Montana (AQCR 143), there were no violations of any air pollution standards. Sulfur dioxide was monitored downwind of a coal-fired power plant for the first six months of 1987 and then discontinued due to the low readings. Other sources of air pollution include oil well flares and vents. Sulfation plates will be used in the future to monitor levels of SO_2 as an alternative to more expensive continuous analyzers.

In western Montana (AQCR 144), the major air pollution problem continues to be particulate matter. Several sites have violated the new PM-10 standards with more expected as data collection becomes complete.

A violation of the PM-10 standard is based upon an expected three-year average, data recovery criteria, and various statistical methods. The mountainous areas of western Montana are predicted to have the greatest difficulty in controlling PM-10. The city of Missoula also struggles with periodic exceedances of the carbon monoxide standards. There was one violation of the eight-hour CO standard of 9 ppm at the Boyd Park site in Missoula and six violations of the Montana 8-hour standard at Malfunction Junction.

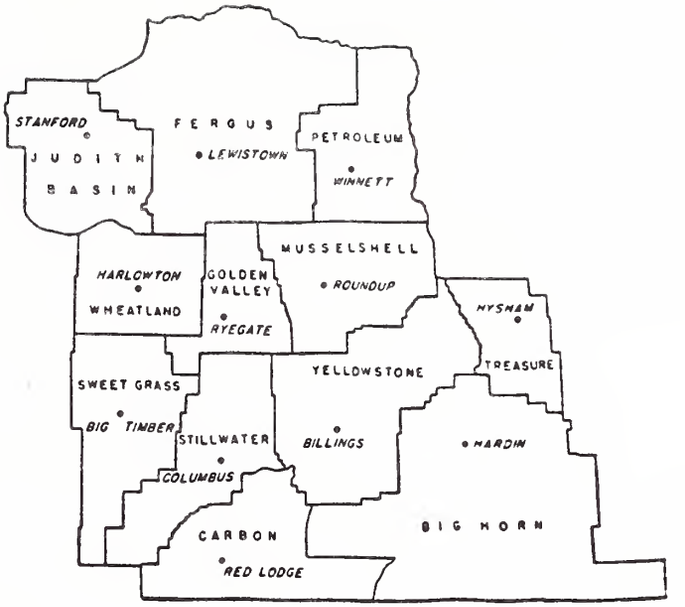
In 1987, EPA adopted a new PM-10 standard which replaces the existing standard for TSP. PM-10 refers to particulate matter with an aerodynamic diameter of 10 microns or less, also called inhalable or respirable particulate. The smaller size particles have been identified as carrying a greater health risk as they can be drawn deep into the lungs. The state monitoring network has been redesigned to fulfill PM-10 monitoring requirements. Sampling schedules are determined by an area's likelihood of violating PM-10 standards, and control strategies are being developed for various communities.

TSP samplers are still used but mainly as an indicator to determine if and when PM-10 monitoring may have to be implemented.

In the second half of this report, several appendices are provided on a variety of topics relating to air quality. These include Attainment-Nonattainment Designations, Ambient Air Quality Standards, and Point Source Emissions.

This report was compiled for use by the general public to provide a brief overview of the air quality of Montana. The Air Quality Bureau

has a small technical library of air quality publications, various statistical reports and data summaries, all available to the general public. The staff of the AQB is also available to answer questions and provide insights into the air quality of Montana.



AQCR 140

South central Montana

LOCATION AND PHYSICAL FEATURES

AQCR 140 is located in south central Montana. Physical features include mountainous areas, foothills and sedimentary plains. The Yellowstone and Musselshell Rivers flow from west to east and cut through the region. The Missouri River borders the region on the north. Wyoming borders it on the south.

POPULATION

The 1987 estimated population of AQCR 140 was 170,900 or approximately 21 percent of the state population. The majority of people in this region live in Yellowstone County (Billings and Laurel), which continues to exhibit the most vigorous growth. Several counties have declined in population since the 1980 census.

POLLUTION SOURCES

Pollution sources and types of pollutants are listed for each county in the region. A final category lists the types of sources that would be expected in all counties in the region. The sources by county are as follows:

Big Horn County

- Four coal strip mines (particulates)

Carbon County

- Calcium manufacturing (particulates)

Stillwater County

- Platinum palladium mine (particulates)

Yellowstone County

- Three oil refineries (SO_2, H_2S, NOx, SO_3, particulates)
- Coal-fired power plant (SO_2, NOx, particulates)
- Sugar beet refinery (SO_2, NOx, particulates)
- Sulfur plant (SO_2, SO_3)
- Grain processing (particulates)

All Counties

- Asphalt plants (particulates)
- Gravel crushers (particulates)
- Home heating devices (particulates, CO)
- Automobiles (CO, NOx, re-entrained particulates)
- Agricultural activities (particulates)
- Wind erosion (particulates)

MONITORING SITE DESCRIPTIONS

The Billings/Laurel area is the population and industrial center for AQCR 140. Consequently, the monitoring effort has been concentrated in this location. Table 1 lists the monitoring site descriptions. This includes site codes, site name, supporting agency, station type, project description, city name and county name, and the parameter or pollutant monitored in 1987.

DATA SUMMARY

Total Suspended Particulates

TSP was monitored at five sites in this region in 1987. One site ran a collocated sampler. The maximum 24-hour observation of 172 $\mu g/m^3$ occurred in April at the Lockwood Park site in Billings. The highest annual geometric average with a complete year of data was 57.6 $\mu g/m^3$ at the City Hall site. Table 2 summarizes the TSP data for this region. Figure 1 shows a four-year comparison of the annual averages for this region's TSP sites.

Sulfur Dioxide

Sulfur dioxide monitoring was discontinued at the Lockwood Park site in January, 1987. The remaining site, Coburn Road, recorded a maximum one-hour reading of 0.689 ppm in December. A maximum three-hour reading of 0.357 ppm, and a twenty-four hour maximum of 0.132 ppm, also occurred in December of 1987.

There were no violations of the federal standards in 1987. This area was exempted from the Montana standards by legislative action.

TABLE 1
AQCR 140 - MONITORING SITE DESCRIPTIONS

AREA/SITE CODE	SITE NAME/ADDRESS SUPPORTING AGENCY	STATION TYPE PROJECT DESCRIPTION	CITY COUNTY	PARAMETER
0080 003 G 02	113 BITTERROOT DRIVE YELLOWSTONE COUNTY AIR POLLUTION CONTROL	RURAL-NEAR URBAN SOURCE ORIENTED	BILLINGS YELLOWSTONE	SULFATION RATE
0080 004 G 02	114 JOHNSON LANE YELLOWSTONE COUNTY AIR POLLUTION CONTROL	RURAL-AGRICULTURAL SOURCE ORIENTED	BILLINGS YELLOWSTONE	SULFATION RATE
0080 006 G 02	LOCKWOOD SCHOOL YELLOWSTONE COUNTY AIR POLLUTION CONTROL	SUBURBAN-INDUSTRIAL SOURCE ORIENTED	BILLINGS YELLOWSTONE	SULFATION RATE
0080 007 G 01	KGHL STATION, WEST OF BILLINGS ON HWY 10 YELLOWSTONE COUNTY AIR POLLUTION CONTROL	RURAL-AGRICULTURAL POPULATION ORIENTED	BILLINGS YELLOWSTONE	SULFATION RATE
0080 008 G 01	CITY HALL, 3RD AVE NORTH & 27TH STREET YELLOWSTONE COUNTY AIR POLLUTION CONTROL	CITY CENTER-COMMERCIAL POPULATION ORIENTED	BILLINGS YELLOWSTONE	TSP,SULFATION RATE
0080 008 G 07	3RD AVE N. & 27TH STREET YELLOWSTONE COUNTY AIR POLLUTION CONTROL	CITY CENTER-COMMERCIAL QA-COLOCATED SAMPLER	BILLINGS YELLOWSTONE	TSP
0080 017 G 02	MINNESOTA AVENUE, 1/2 MI NE OF CONOCO YELLOWSTONE COUNTY AIR POLLUTION CONTROL	SUBURBAN-INDUSTRIAL SOURCE ORIENTED	BILLINGS YELLOWSTONE	SULFATION RATE
0080 018 G 02	5TH STREET & SOUTH 28TH YELLOWSTONE COUNTY AIR POLLUTION CONTROL	SUBURBAN-RESIDENTIAL SOURCE ORIENTED	BILLINGS YELLOWSTONE	SULFATION RATE
0080 019 G 02	SOUTH 27TH & 11TH AVENUE SOUTH YELLOWSTONE COUNTY AIR POLLUTION CONTROL	SUBURBAN-COMMERCIAL SOURCE ORIENTED	BILLINGS YELLOWSTONE	SULFATION RATE
0080 034 G 02	PICCOLO & FRONTAGE ROAD YELLOWSTONE COUNTY AIR POLLUTION CONTROL	RURAL-INDUSTRIAL SOURCE ORIENTED	BILLINGS YELLOWSTONE	SULFATION RATE
0080 038 G 02	JOHNSON ROAD NORTH, 1 MILE NE OF EXXON YELLOWSTONE COUNTY AIR POLLUTION CONTROL	RURAL-AGRICULTURAL SOURCE ORIENTED	BILLINGS YELLOWSTONE	SULFATION RATE
0080 065 F 01	LOCKWOOD PARK (NAMS SITE) MONTANA AIR QUALITY BUREAU	SUBURBAN-RESIDENTIAL POPULATION ORIENTED	BILLINGS YELLOWSTONE	SO2,WIND
0080 065 G 02	LOCKWOOD PARK YELLOWSTONE COUNTY AIR POLLUTION CONTROL	SUBURBAN-RESIDENTIAL SOURCE ORIENTED	BILLINGS YELLOWSTONE	TSP,SULFATION RATE
0080 066 F 05	COBURN ROAD, SOUTH OF BILLINGS MONTANA AIR QUALITY BUREAU	RURAL-NEAR URBAN SPECIAL STUDIES	BILLINGS YELLOWSTONE	SO2,WIND
0080 066 G 02	COBURN ROAD YELLOWSTONE COUNTY AIR POLLUTION CONTROL	RURAL-NEAR URBAN SOURCE ORIENTED	BILLINGS YELLOWSTONE	SULFATION RATE
0080 072 G 01	GRAND AVENUE, 1320 GRAND AVENUE YELLOWSTONE COUNTY AIR POLLUTION CONTROL	SUBURBAN-COMMERCIAL POPULATION ORIENTED	BILLINGS YELLOWSTONE	TSP,SULFATION RATE,PM10
0080 073 G 02	SCOTTISH RITES-COUNTY, CORNER 14 & TERRY MONTANA AIR QUALITY BUREAU	CITY CENTER-RESIDENTIAL SOURCE ORIENTED	BILLINGS YELLOWSTONE	TSP,SULFATION RATE
0840 001 G 02	LAUREL JUNIOR HIGH - 410 COLORADO AVE	CITY CENTER-RESIDENTIAL	LAUREL	TSP,SULFATION RATE

TABLE 1

AQCR 140 - MONITORING SITE DESCRIPTIONS

AREA/SITE CODE	SITE NAME/ADDRESS SUPPORTING AGENCY	STATION TYPE PROJECT DESCRIPTION	CITY COUNTY	PARAMETER
	YELLOWSTONE COUNTY AIR POLLUTION CONTROL	SOURCE ORIENTED	YELLOWSTONE	
0840 003 G 02	ROADHOUSE ROAD - 1 MI NE OF CENEX YELLOWSTONE COUNTY AIR POLLUTION CONTROL	RURAL-INDUSTRIAL SOURCE ORIENTED	LAUREL YELLOWSTONE	SULFATION RATE
0840 005 G 02	LAUREL WATER PLANT - 1/2 MI S OF CENEX YELLOWSTONE COUNTY AIR POLLUTION CONTROL	RURAL-NEAR URBAN SOURCE ORIENTED	LAUREL YELLOWSTONE	SULFATION RATE
0840 006 G 02	WEST LAUREL CHURCH - 1/2 MI WNW OF CENEX YELLOWSTONE COUNTY AIR POLLUTION CONTROL	SUBURBAN-RESIDENTIAL SOURCE ORIENTED	LAUREL YELLOWSTONE	SULFATION RATE
0840 009 G 02	FARM EAST OF CENEX - 3/8 MI NE OF CENEX YELLOWSTONE COUNTY AIR POLLUTION CONTROL	RURAL-AGRICULTURAL SOURCE ORIENTED	LAUREL YELLOWSTONE	SULFATION RATE
0840 013 G 02	WEST COOP - 1/4 MI WEST OF CENEX YELLOWSTONE COUNTY AIR POLLUTION CONTROL	RURAL-INDUSTRIAL SOURCE ORIENTED	LAUREL YELLOWSTONE	SULFATION RATE

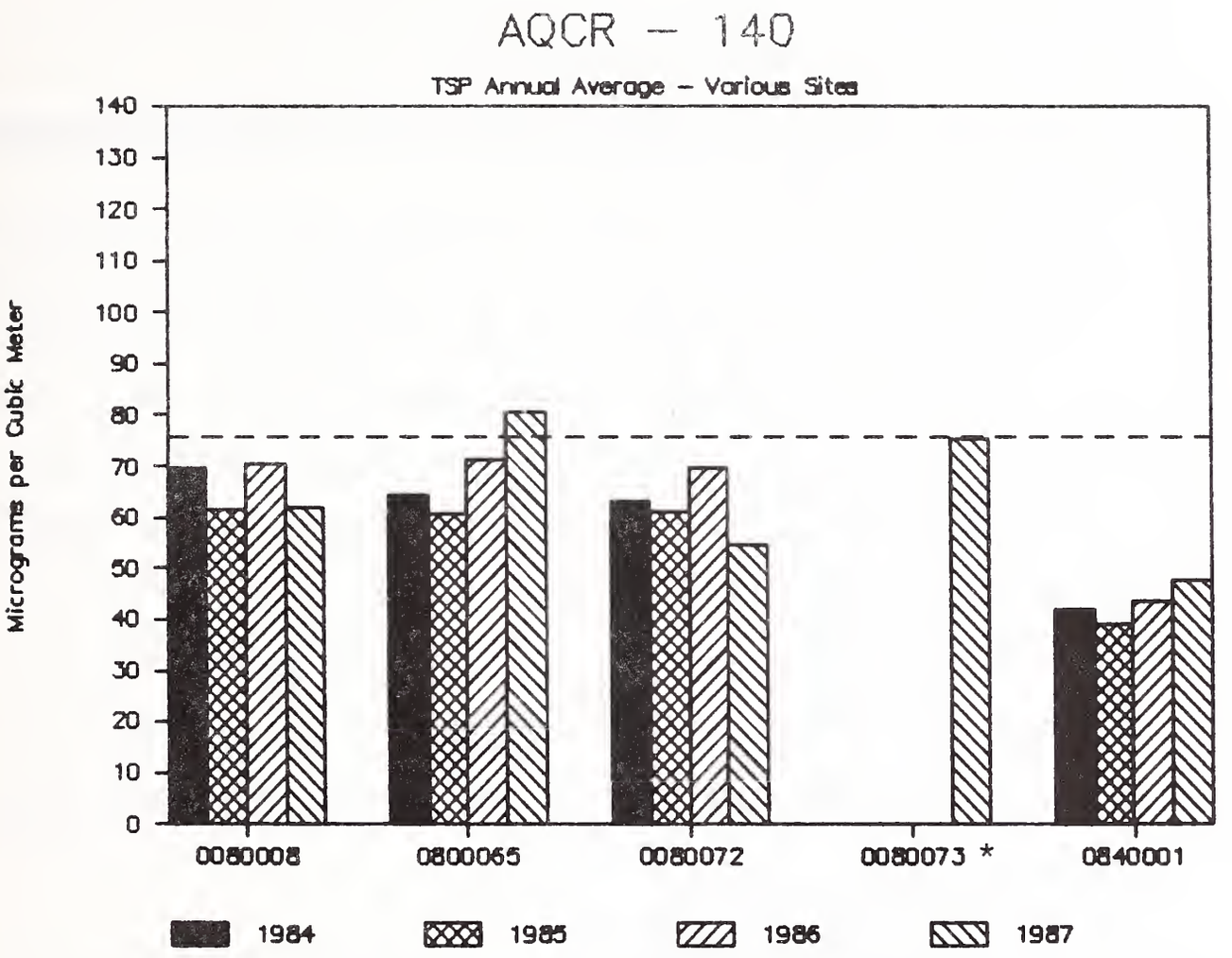
PARAMETER ABBREVIATIONS:

TSP - TOTAL SUSPENDED PARTICULATES
PM10 - PARTICULATE MATTER 10 (SIZE 10 MICRONS AND UNDER)
CO - CARBON MONOXIDE
SO2 - SULFUR DIOXIDE
WIND - WIND SPEED, WIND DIRECTION AND TEMPERATURE

TABLE 2
AQCR 140 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean	Geom Mean
Yellowstone/Billings								
0080 008 G 01	City Hall	82	55	153	109	107	65.4	59.9
		83	55	152	127	107	60.3	55.6
		84	58	143	133	131	69.5	63.3
		85	59	176	135	130	61.5	55.8
		86	56	154	123	119	70.7	62.9
		87	59	134	109	95	61.9	57.6
0080 008 G 07	City Hall-Collocated	82	57	165	112	107	64.9	59.6
		83	52	153	127	106	62.3	58.3
		84	59	144	139	137	70.1	64.0
		85	60	190	143	139	64.3	57.8
		86	56	159	121	121	68.1	60.6
		87	60	134	109	107	62.5	58.1
0080 065 F 01	Lockwood Park	83	21	293	186	148	75.9	60.1
		84	57	187	153	148	64.5	52.8
		85	57	148	133	123	60.7	52.0
		86	56	225	178	151	71.2	60.3
		87	37	172	164	154	80.8	71.0
0080 072 G 01	Grand Avenue School	82	56	124	119	103	60.4	56.4
		83	53	148	143	131	57.2	51.4
		84	55	138	106	102	63.2	58.0
		85	58	237	165	121	61.1	53.7
		86	57	175	169	165	69.9	60.9
		87	43	95	87	80	54.7	51.9
0080 073 G02	Scottish Rites	87	7	121	84	75	75.6	73.1
Yellowstone/Laurel								
0840 001 G 02	Laurel Junior High	82	55	77	74	73	37.6	33.8
		83	53	81	59	59	37.8	35.0
		84	55	107	92	76	41.9	37.0
		85	53	97	91	72	39.3	35.4
		86	57	115	90	80	43.5	38.3
		87	61	121	107	95	47.9	42.3

FIGURE 1



* Note: data was incomplete at this site

Several Billings industries operate additional SO_2 analyzers as part of a cooperative effort to monitor the concentrations of SO_2 in the Billings area. The state-operated sites are summarized in Table 3 and Table 4 shows the number of exceedances.

Sulfation Rate

The sulfation rate network was cut back to 20 sites in Yellowstone County during 1987. The highest monthly observation was 1.52 mg SO_3/100 cm^2/day at the Johnson Road North site. The highest annual average was 0.96 mg SO_3/100 cm^2/day, also at the Johnson Road North site. There is no standard for sulfation rate; however, readings greater than 0.5 mg SO_3/100 cm^2/day indicate possible trouble spots and warrant continued sampling. Table 5 summarizes the sulfation rate data. Figures 2 and 3 show a four-year comparison of the sulfation rate data at the Billings and Laurel sites.

Respirable Particulates (PM-10)

Particulate matter less than 10 microns (PM-10) was monitored at the Grand Avenue School during 1987. The maximum 24-hour observation was 53 $\mu g/m^3$. Table 6 summarizes the PM-10 data for this site and Table 7 shows the number of exceedances.

TABLE 3a
AQCR 140 - SULFUR DIOXIDE
Parts Per Million

Site Code	Site Name/Location	Yr	Mo	Num Obs	Max Obs	2nd Max	3rd Max	3 Hr Max	24 Hr Max	Mo Avg
0080 065 F 01	Lockwood Park	82	01	733	.267	.261	.257	.223	.139	.026
			02	663	.228	.227	.210	.170	.077	.034
			03	724	.260	.250	.232	.162	.075	.019
			04	593	.657	.623	.520	.600	.109	.020
			05	733	.322	.230	.200	.200	.056	.014
			06	596	.284	.227	.224	.238	.067	.015
			07	563	.287	.222	.200	.187	.080	.017
			08	716	.243	.242	.239	.200	.067	.024
			09	601	.324	.248	.205	.210	.063	.023
			10	632	.278	.257	.252	.230	.062	.024
			11	713	.235	.234	.218	.188	.059	.026
			12	739	.663	.542	.411	.483	.173	.036
		ANNUAL		8106	.663	.657	.623	.600	.173	.023
0080 065 F 01	Lockwood Park	83	01	736	.468	.323	.252	.281	.130	.033
			02	559	.562	.490	.438	.380	.104	.032
			03	738	.500	.388	.354	.344	.103	.021
			04	700	.347	.326	.233	.198	.068	.019
			05	735	.277	.183	.177	.155	.056	.021
			06	676	.442	.361	.265	.325	.116	.029
			07	731	.360	.302	.290	.233	.070	.031
			08	733	.401	.388	.369	.317	.103	.036
			09	632	.527	.460	.410	.392	.095	.035
			10	431	.332	.215	.202	.169	.062	.033
			11	712	.248	.189	.185	.172	.091	.028
			12	567	.175	.175	.174	.157	.087	.038
		ANNUAL		7950	.562	.527	.500	.392	.130	.029
0080 065 F 01	Lockwood Park	84	01	734	.207	.182	.170	.171	.089	.042
			02	683	.214	.182	.148	.180	.068	.020
			03	701	.225	.151	.149	.146	.038	.015
			04	716	.266	.173	.170	.134	.093	.013
			05	566	.293	.253	.199	.212	.039	.014
			06	547	.219	.177	.146	.144	.046	.013
			07	---	---	---	---	---	---	---
			08	459	.322	.311	.255	.180	.066	.029
			09	702	.378	.271	.222	.197	.067	.025
			10	59	.328	.306	.212	.277	.110	.060
			11	84	.089	.056	.054	.054	.025	.017
			12	717	.550	.400	.210	.293	.067	.029
		ANNUAL		5968	.550	.400	.378	.293	.110	.023

TABLE 3b
AQCR 140 - SULFUR DIOXIDE
Parts Per Million

Site Code	Site Name/Location	Yr	Mo	Num Obs	Max Obs	2nd Max	3rd Max	3 Hr Max	24 Hr Max	Mo Avg
0080 065 F 01	Lockwood Park	85	01	688	.494	.398	.326	.406	.167	.037
			02	528	.136	.129	.115	.098	.049	.020
			03	654	.176	.161	.161	.142	.051	.018
			04	561	.196	.158	.144	.117	.040	.013
			05	727	.197	.188	.186	.108	.030	.014
			06	686	.394	.246	.236	.314	.098	.020
			07	732	.332	.291	.213	.174	.074	.023
			08	226	.439	.226	.211	.275	.069	.024
			09	457	.201	.190	.177	.177	.062	.017
			10	739	.231	.221	.217	.193	.079	.019
			11	712	.299	.282	.280	.269	.104	.020
			12	734	.373	.238	.230	.222	.077	.023
		ANNUAL		7444	.494	.439	.398	.406	.167	.021
0080 065 F 01	Lockwood Park	86	01	740	.329	.279	.270	.224	.070	.027
			02	668	.441	.243	.204	.296	.095	.021
			03	734	.302	.269	.256	.186	.064	.019
			04	711	.275	.270	.240	.211	.112	.025
			05	718	.244	.228	.224	.179	.053	.017
			06	712	.437	.400	.377	.282	.059	.023
			07	737	.373	.255	.252	.249	.068	.027
			08	638	.304	.241	.234	.229	.061	.030
			09	705	.325	.208	.197	.209	.056	.016
			10	739	.432	.380	.369	.379	.115	.034
			11	713	.341	.262	.247	.261	.069	.021
			12	733	.361	.245	.184	.204	.071	.033
		ANNUAL		8548	.441	.437	.432	.379	.115	.024
0080 065 F 01	Lockwood Park	87	01	298	.186	.143	.120			.033
			02	---	---	---	---	---	---	---
			03	---	---	---	---	---	---	---
			04	---	---	---	---	---	---	---
			05	---	---	---	---	---	---	---
			06	---	---	---	---	---	---	---
			07	---	---	---	---	---	---	---
			08	---	---	---	---	---	---	---
			09	---	---	---	---	---	---	---
			10	---	---	---	---	---	---	---
			11	---	---	---	---	---	---	---
			12	---	---	---	---	---	---	---
		ANNUAL		298	.186	.143	.120	.124	.050	.033

TABLE 3c
AQCR 140 - SULFUR DIOXIDE
Parts Per Million

Site Code	Site Name/Location	Yr	Mo	Num Obs	Max Obs	2nd Max	3rd Max	3 Hr Max	24 Hr Max	Mo Avg
0080 066 F 05	Coburn Road	82	01	728	.409	.392	.359	.314	.155	.052
			02	601	.342	.265	.231	.187	.098	.043
			03	630	.263	.242	.217	.240	.071	.024
			04	634	.310	.275	.220	.261	.052	.013
			05	649	.210	.115	.111	.095	.021	.007
			06	707	.150	.131	.113	.111	.035	.011
			07	733	.227	.195	.169	.135	.050	.012
			08	734	.385	.307	.270	.202	.072	.028
			09	528	.335	.275	.275	.288	.074	.026
			10	448	.331	.223	.184	.231	.072	.033
			11	151	.213	.176	.149	.127	.073	.051
			12	734	.541	.373	.360	.397	.140	.040
		ANNUAL		7277	.541	.409	.392	.397	.155	.026
0080 066 F 05	Coburn Road	83	01	739	.778	.697	.581	.650	.222	.051
			02	668	.345	.334	.275	.211	.087	.036
			03	704	.449	.357	.249	.296	.086	.017
			04	706	.263	.230	.209	.180	.050	.012
			05	733	.229	.222	.217	.140	.050	.011
			06	713	.398	.312	.207	.206	.045	.010
			07	568	.195	.192	.169	.157	.064	.022
			08	525	.333	.286	.267	.251	.076	.036
			09	709	.422	.417	.308	.315	.119	.032
			10	576	.399	.365	.362	.341	.070	.024
			11	646	.201	.199	.184	.150	.086	.038
			12	570	.321	.243	.236	.206	.108	.047
		ANNUAL		7857	.778	.697	.581	.650	.222	.027
0080 066 F 05	Coburn Road	84	01	734	.220	.212	.208	.210	.088	.035
			02	174	.145	.126	.099	.088	.037	.014
			03	633	.310	.134	.131	.123	.038	.011
			04	712	.279	.196	.195	.201	.042	.012
			05	366	.218	.140	.129	.109	.029	.013
			06	158	.293	.198	.141	.178	.038	.020
			07	---	---	---	---	---	---	---
			08	571	.372	.268	.227	.187	.069	.030
			09	712	.362	.237	.198	.207	.073	.027
			10	85	.350	.310	.300	.300	.121	.076
			11	---	---	---	---	---	---	---
			12	464	.438	.418	.282	.224	.120	.052
		ANNUAL		4609	.438	.418	.372	.300	.121	.026

TABLE 3d
AQCR 140 - SULFUR DIOXIDE
Parts Per Million

Site Code	Site Name/Location	Yr	Mo	Num Obs	Max Obs	2nd Max	3rd Max	3 Hr Max	24 Hr Max	Mo Avg
0080 066 F 05	Coburn Road	85	01	726	.996	.813	.727	.845	.202	.041
			02	567	.328	.284	.246	.263	.089	.022
			03	517	.358	.253	.247	.212	.120	.029
			04	245	.240	.208	.128	.119	.032	.009
			05	580	.262	.159	.142	.115	.031	.011
			06	683	.205	.170	.162	.149	.044	.014
			07	728	.334	.219	.204	.169	.053	.023
			08	72	.082	.079	.061	.069	.027	.016
			09	423	.177	.152	.138	.110	.034	.011
			10	704	.502	.443	.359	.408	.135	.031
			11	635	.305	.295	.288	.246	.111	.031
			12	547	.305	.290	.261	.204	.099	.033
		ANNUAL		6427	.996	.813	.727	.845	.202	.024
0080 066 F 05	Coburn Road	86	01	739	.254	.206	.206	.222	.094	.030
			02	651	.603	.529	.270	.467	.109	.024
			03	723	.389	.148	.130	.183	.042	.014
			04	714	.314	.289	.185	.250	.055	.015
			05	730	.149	.139	.136	.096	.042	.011
			06	515	.332	.187	.171	.178	.060	.018
			07	339	.233	.180	.146	.143	.042	.019
			08	736	.489	.366	.329	.311	.092	.041
			09	551	.268	.154	.134	.138	.034	.014
			10	676	.411	.386	.338	.285	.108	.042
			11	715	.337	.320	.272	.224	.102	.033
			12	721	.394	.323	.317	.251	.097	.045
		ANNUAL		7810	.603	.529	.489	.467	.109	.026
0080 066 F 05	Coburn Road	87	01	734	.280	.218	.194	.145	.066	.025
			02	630	.217	.200	.183	.149	.056	.024
			03	702	.205	.201	.183	.156	.047	.016
			04	671	.239	.239	.220	.200	.061	.017
			05	570	.155	.149	.145	.120	.031	.012
			06	686	.219	.219	.208	.167	.046	.017
			07	706	.350	.230	.221	.167	.047	.019
			08	223	.237	.207	.202	.168	.048	.021
			09	333	.364	.359	.355	.357	.087	.039
			10	671	.338	.333	.333	.285	.120	.035
			11	685	.335	.319	.277	.231	.086	.036
			12	642	.689	.351	.303	.357	.132	.028
		ANNUAL		7258	.689	.364	.359	.357	.132	.024

TABLE 4
AQCR 140 - SO2 - Number of Exceedances
Parts per Million

County/City Site Code/Site Name/Location	Yr	Num Obs	Federal Prim 24-Hr 0.14	 Annual 0.03	Federal Sec 3-Hr 0.50	Billings/Laurel Std 1-Hr 0.50	 24-Hr 0.14	 Annual 0.03
Yellowstone/Billings								
0080 066 F 05 Coburn Road	85	6427	1	0	2	--	--	--
	86	7810	0	0	0	--	--	--
	87	7258	0	0	0	0	0	0

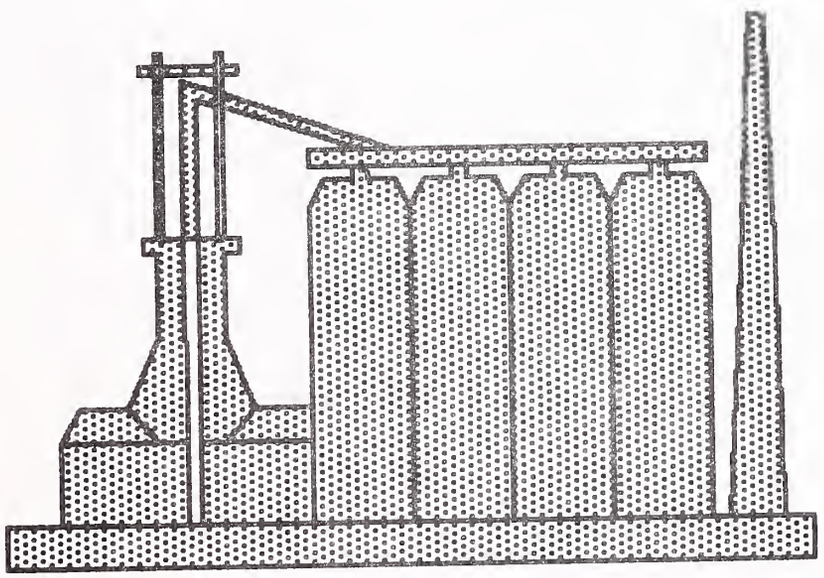


TABLE 5a
AQCR 140 - SULFATION RATE
Milligrams Sulfur Trioxide per 100 Square Centimeters per Day

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean
Yellowstone/Billings							
0080 003 G 02	Bitterroot	82	12	.56	.47	.40	.28
		83	12	.53	.52	.50	.35
		84	12	.82	.49	.42	.36
		85	12	.51	.51	.47	.32
		86	12	.69	.55	.52	.41
		87	12	.39	.33	.32	.24
0080 004 G 02	Johnson Lane	82	12	1.09	.82	.71	.51
		83	11	1.19	1.03	.79	.57
		84	12	1.25	1.09	.94	.70
		85	12	1.13	1.00	.92	.64
		86	10	1.23	.92	.85	.81
		87	12	.70	.66	.65	.49
0080 006 G 02	Lockwood School	82	12	1.16	1.15	1.11	.61
		83	12	1.08	.99	.89	.68
		84	12	1.25	1.07	.94	.73
		85	12	.98	.87	.86	.64
		86	12	1.03	.96	.96	.81
		87	12	.72	.68	.67	.56
0080 007 G 01	KGHL Station	82	12	.96	.55	.53	.36
		83	12	.85	.55	.45	.37
		84	11	.81	.48	.46	.28
		85	12	.69	.58	.44	.30
		86	12	.61	.44	.44	.32
		87	12	.44	.40	.38	.29
0080 008 G 01	City Hall	82	12	.47	.38	.31	.21
		83	12	.69	.45	.39	.36
		84	12	.56	.50	.39	.24
		85	12	.61	.55	.49	.30
		86	12	.45	.42	.36	.30
		87	12	.31	.28	.26	.20
0080 017 G 02	Minnesota Avenue	82	12	.82	.71	.63	.45
		83	12	.88	.67	.66	.46
		84	12	.86	.79	.78	.47
		85	12	.78	.73	.66	.45
		86	12	.80	.73	.67	.52
		87	12	.48	.43	.40	.31

TABLE 5b
AQCR 140 - SULFATION RATE
Milligrams Sulfur Trioxide per 100 Square Centimeters per Day

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean
Yellowstone/Billings							
0080 018 G 02	5th Street & South 28th	82	11	.67	.56	.48	.35
		83	12	.69	.50	.36	.32
		84	12	.55	.51	.45	.30
		85	12	.66	.56	.39	.31
		86	12	.59	.53	.47	.36
		87	12	.35	.33	.31	.23
0080 019 G 02	South 27th & 11th Ave. S.	82	10	1.05	.94	.53	.51
		83	12	1.10	.69	.67	.50
		84	12	.88	.71	.60	.45
		85	12	.92	.85	.82	.54
		86	12	.83	.76	.72	.54
		87	12	.71	.70	.43	.40
0080 034 G 02	Piccolo and Frontage Road	82	12	1.58	1.38	1.34	1.14
		83	12	1.54	1.41	1.08	.98
		84	12	1.79	1.45	1.33	1.02
		85	12	1.38	1.29	1.19	.99
		86	12	1.68	1.51	1.38	1.22
		87	11	1.22	1.10	1.07	.87
0080 038 G 02	Johnson Road North	82	12	1.46	1.38	1.15	.83
		83	12	1.60	1.58	1.39	.91
		84	12	2.43	1.44	1.41	1.12
		85	12	1.80	1.68	1.51	.95
		86	11	2.02	1.95	1.85	1.28
		87	12	1.52	1.42	1.35	.96
0080 065 G 02	Lockwood Park	84	12	1.37	.96	.89	.73
		85	12	.87	.84	.81	.66
		86	11	1.17	1.11	1.06	.92
		87	12	.73	.70	.65	.53
0080 066 G 02	Coburn Road	84	12	2.15	1.62	1.55	1.02
		85	12	1.89	1.70	1.61	1.06
		86	12	1.87	1.57	1.49	1.17
		87	12	1.14	1.13	.75	.66

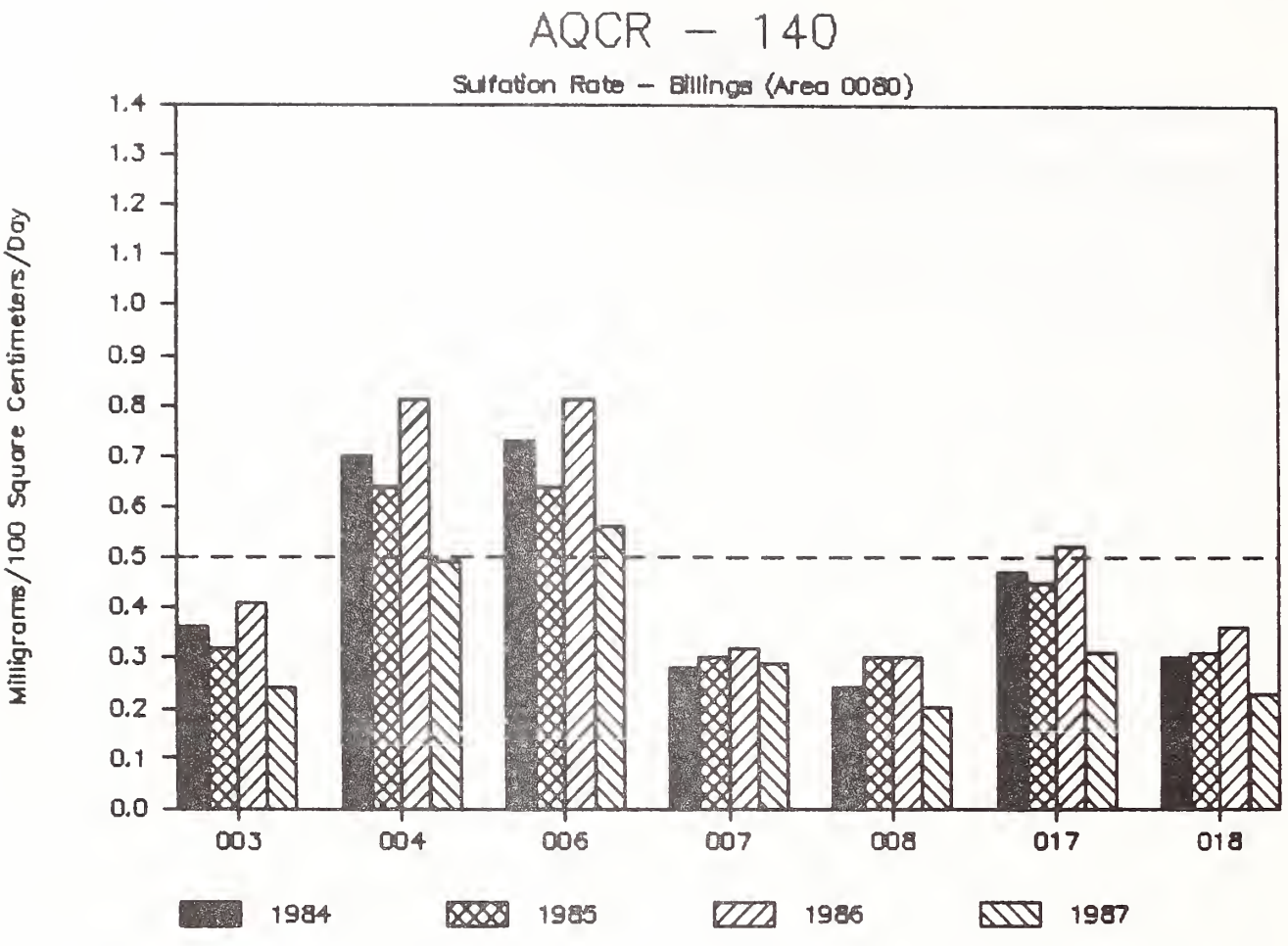
TABLE 5c
AQCR 140 - SULFATION RATE
Milligrams Sulfur Trioxide per 100 Square Centimeters per Day

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean
Yellowstone/Billings							
0080 072 G 01	Grand Avenue School	82	12	.59	.39	.28	.21
		83	12	.62	.25	.22	.36
		84	12	.61	.40	.35	.21
		85	12	.61	.54	.43	.25
		86	12	.59	.50	.41	.31
		87	11	.38	.32	.26	.21
0080 073 G 02	Scottish Rites	87	1	.32	---	---	.32
Yellowstone/Laurel							
0840 001 G 02	Laurel Junior High	82	10	.43	.17	.09	.10
		83	12	.50	.16	.16	.11
		84	12	.23	.21	.20	.08
		85	12	.38	.37	.19	.13
		86	12	.37	.20	.16	.10
		87	12	.08	.07	.06	.05
0840 003 G 02	Roadhouse Road	82	12	1.03	.81	.65	.43
		83	12	1.05	1.04	.73	.48
		84	12	1.49	.96	.86	.55
		85	12	1.50	1.15	1.02	.64
		86	12	1.59	1.49	1.14	.82
		87	12	1.11	.69	.66	.46
0840 005 G 02	Laurel Water Plant	82	12	.64	.62	.61	.42
		83	12	.66	.62	.59	.43
		84	12	.67	.66	.65	.49
		85	12	.78	.70	.60	.49
		86	12	1.39	.83	.79	.70
		87	12	.39	.39	.33	.26
0840 006 G 02	West Laurel Church	82	10	.43	.22	.17	.13
		83	12	.52	.20	.20	.17
		84	12	.27	.26	.22	.14
		85	10	.40	.23	.22	.16
		86	11	.36	.35	.28	.17
		87	11	.13	.10	.08	.06

TABLE 5d
AQCR 140 - SULFATION RATE
Milligrams Sulfur Trioxide per 100 Square Centimeters per Day

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean
Yellowstone/Billings							
0840 009 G 02	Farm East of CENEX	82	10	1.51	1.16	.99	.77
		83	11	2.00	1.60	1.37	.90
		84	12	2.74	1.46	1.06	1.03
		85	12	1.67	1.51	1.28	.96
		86	12	2.11	2.08	1.94	1.43
		87	11	1.36	1.34	1.11	.86
0840 013 G 02	West Coop	82	9	.26	.24	.18	.15
		83	11	.46	.32	.23	.19
		84	12	.31	.24	.24	.15
		85	12	.39	.38	.37	.23
		86	12	.59	.43	.39	.27
		87	12	.21	.16	.12	.10

FIGURE 2


AQCR – 140
Sulfation Rate – Billings (Area 0080)
Milligrams/100 Square Centimeters/Day
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
003
004
006
007
008
017
018
1984
1985
1986
1987

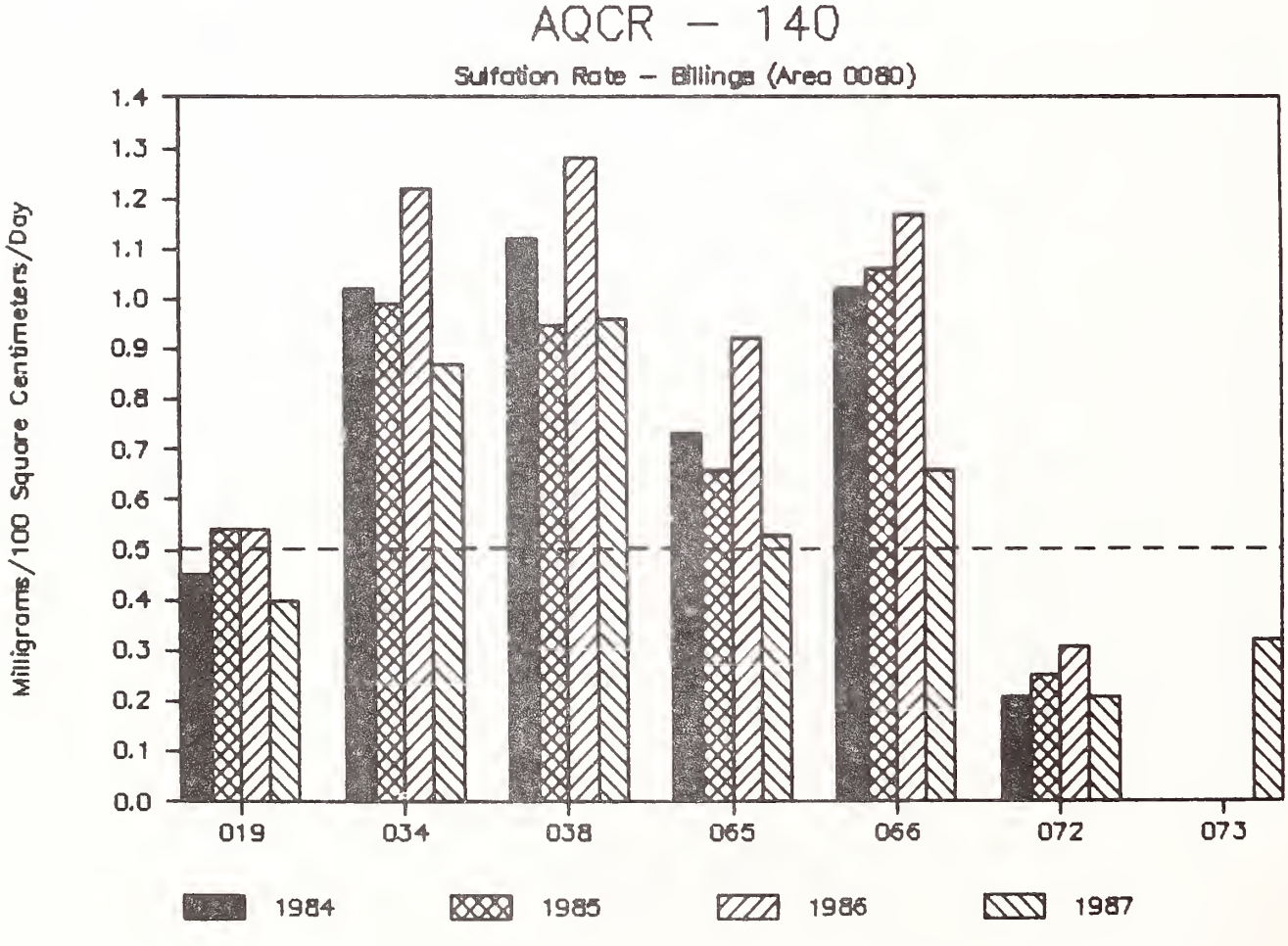

AQCR – 140
Sulfation Rate – Billings (Area 0080)
Milligrams/100 Square Centimeters/Day
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
019
034
038
065
066
072
073
1984
1985
1986
1987

FIGURE 3

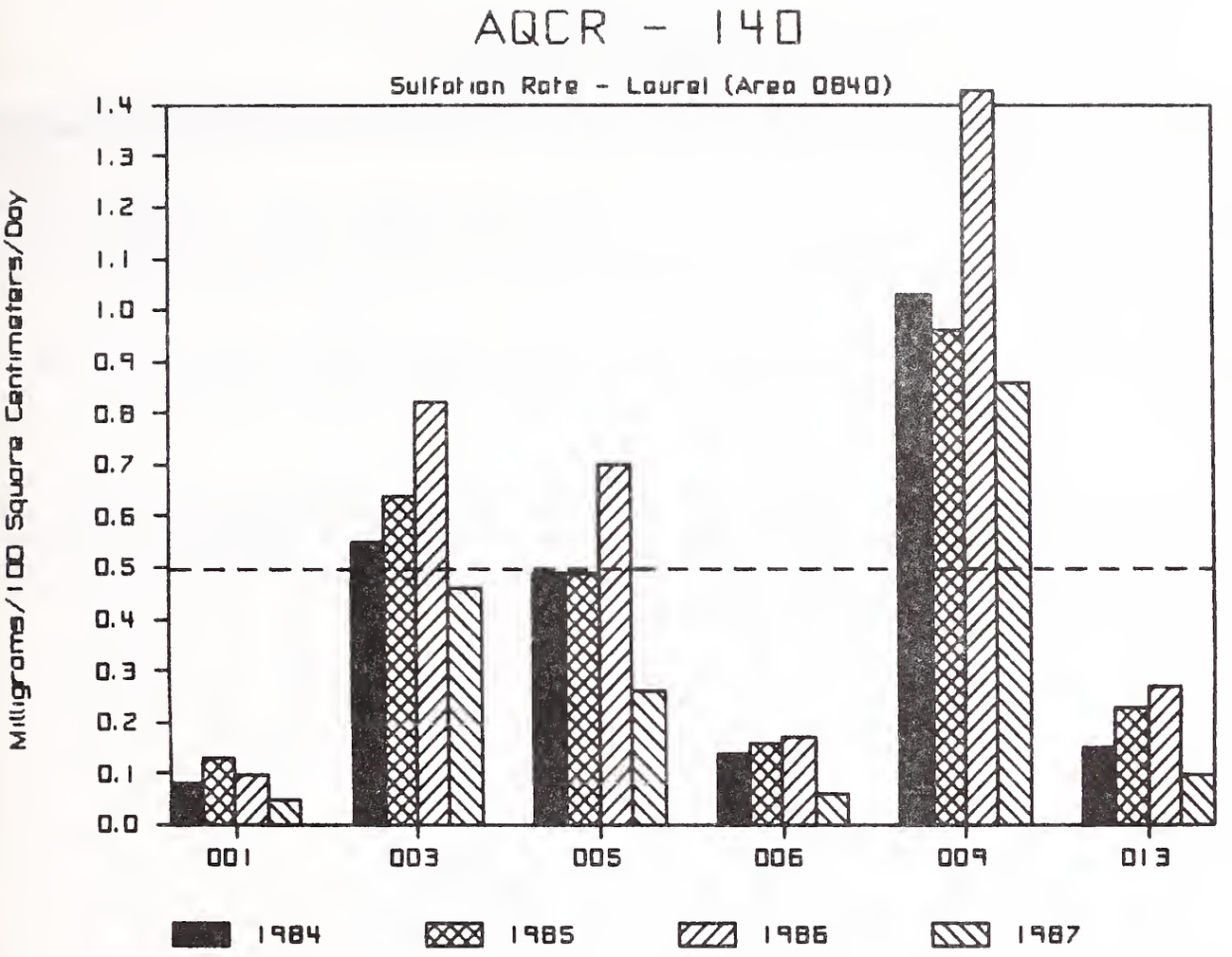

AQCR - 140
Sulfation Rate - Laurel (Area 0840)
Milligrams/100 Square Centimeters/Day
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
001
003
005
006
009
013
1984
1985
1986
1987

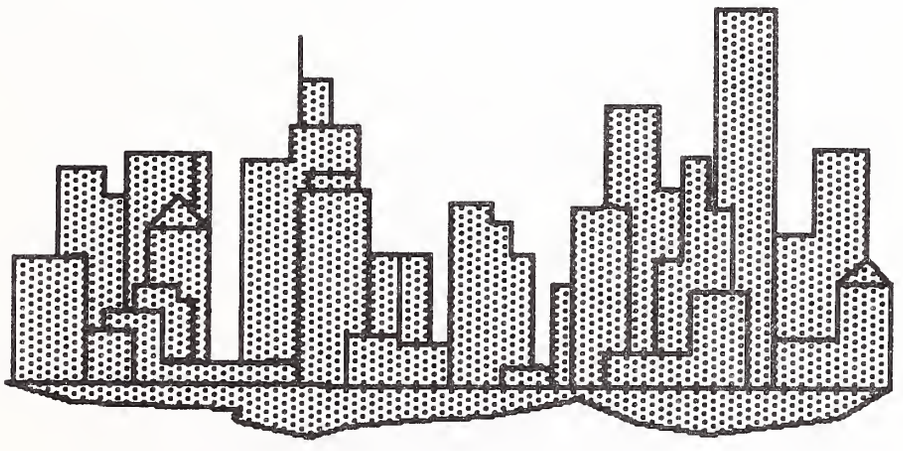
TABLE 6
AQCR 140 - RESPIRABLE PARTICULATES (PM-10)
Micrograms per Cubic Meter

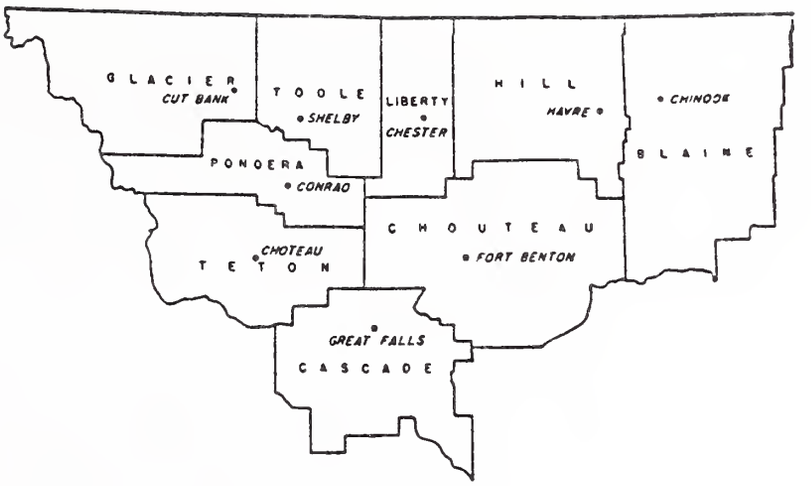
County/City Site Code/Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean	Weighted Annual Average*
Yellowstone/Billings							
0080 072 G 01 Grand Avenue School	86	25	84	79	70	33.6	31.0
	87	24	53	44	40	28.7	28.4

*Data from within a specified sampling period is averaged into one value. These values are then averaged within the quarter. The annual average is derived from the quarterly averages. With this method, additional sampling within a sampling period will not bias the data.

TABLE 7
AQCR 140 - PM-10 - Number of Exceedances
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Federal/State Annual Average 50	Federal/State 24-Hour >150
Yellowstone/Billings					
0080 072 G 01	Grand Avenue School	87	24	0	0





AQCR 141

North central Montana

LOCATION AND PHYSICAL FEATURES

AQCR 141 is located in north central Montana. Glaciated plain is the main physical feature. There are some foothills and mountainous areas along the western edge of the Continental Divide and south of Havre at the Bearpaw Mountains.

The Missouri River flows from west to east in the southern portion of the region. Several other tributary rivers of the Missouri also flow from west to east in the region.

POPULATION

The 1987 estimated population of AQCR 141 was 140,000 or 17.3 percent of the state population. Over half of the people in this region live in Cascade County in or near the city of Great Falls.

POLLUTION SOURCES

Pollution sources and types of pollutants are listed for each county in the region. A final category lists the types of sources that would be expected in all counties in the region. The sources by county are as follows:

Cascade County

Several grain processing and feed mills (particulates)

Oil refinery (particulates, SO_2, NOx, CO, VOC)

Vermiculite exfoliation (particulates)

Coal-fired power plant (SO_2, NOx, particulates)

Glacier County

Two gas sweetening plants (SO_2, NOx)

Teton County

Gas sweetening plant (SO_2, NOx)

Toole County

Gas sweetening plant (SO_2, NOx)

All Counties

Asphalt plants (particulates)

Gravel crushers (particulates)

Home heating devices (particulates, CO)

Automobiles (CO, NOx, re-entrained particulates)

Agricultural activities (particulates)

Wind erosion (particulates)

MONITORING SITE DESCRIPTIONS

The majority of monitoring in this region was done in the Great Falls area. Table 8 lists the monitoring site descriptions. This includes site codes, site name, supporting agency, station type, project description, city name and county name, and the parameters or pollutants monitored in 1987.

DATA SUMMARY

Total Suspended Particulates

TSP was monitored at four sites in this region in 1987. One of the sites was collocated. The maximum 24-hour observation was 228 $\mu g/m^3$ at the Fire Station #1 site. The highest annual geometric average was 64.7 $\mu g/m^3$ and the highest annual arithmetic average was 72.6 $\mu g/m^3$, both at the Fire Station site. Table 9 summarizes the TSP data for this region. Figure 4 shows a four-year comparison of the annual averages for the TSP sites in the region.

Carbon Monoxide

Carbon monoxide was monitored at one location (Pardis Clinic) in this region. The maximum eight-hour observation of 11.9 ppm and the maximum one-hour reading of 22.4 ppm occurred in March. The Montana and federal 8-hour standard of 9 ppm was violated four times during 1987. Table 10 summarizes the CO data for this region and Table 11 shows the number of exceedances of the CO standards.

TABLE 8

AQCR 141 - MONITORING SITE DESCRIPTIONS

AREA SITE CODE	SITE NAME/ADDRESS SUPPORTING AGENCY	STATION TYPE PROJECT DESCRIPTION	CITY COUNTY	PARAMETER
0660 009 G 01	FIRE STATION #1 - 9TH ST & 1ST AVE SOUTH CASCADE COUNTY HEALTH DEPARTMENT	CITY CENTER-RESIDENTIAL POPULATION ORIENTED	GREAT FALLS CASCADE	TSP
0660 017 G 01	DOWNTOWN (WEST) - 301 2ND AVE N CASCADE COUNTY HEALTH DEPARTMENT	CITY CENTER-COMMERCIAL POPULATION ORIENTED	GREAT FALLS CASCADE	TSP,PM10
0660 017 G 07	DOWNTOWN (EAST) - 301 2ND AVE N CASCADE COUNTY HEALTH DEPARTMENT	CITY CENTER-COMMERCIAL QA-COLOCATED SAMPLER	GREAT FALLS CASCADE	TSP
0660 019 G 01	BLACK EAGLE PO - 1321 SMELTER AVE CASCADE COUNTY HEALTH DEPARTMENT	CITY CENTER-COMMERCIAL POPULATION ORIENTED	GREAT FALLS CASCADE	TSP
0660 023 G 02	PARDIS CLINIC - 826 10TH AVE SOUTH CASCADE COUNTY HEALTH DEPARTMENT	CITY CENTER-COMMERCIAL SOURCE ORIENTED	GREAT FALLS CASCADE	CO,WIND
0660 024 G 01	SUNNYSIDE SCHOOL 1800 19TH AVE SO CASCADE COUNTY AIR POLLUTION CONTROL	SUBURBAN-RESIDENTIAL POPULATION ORIENTED	GREAT FALLS CASCADE	TSP
1530 008 F 05	ANABELLE SHEETS RESIDENCE, HIWAY 91 MONTANA AIR QUALITY BUREAU	RURAL-AGRICULTURAL SPECIAL STUDIES	DILMONT TOOLE	SULFATION RATE

PARAMETER ABBREVIATIONS:

TSP - TOTAL SUSPENDED PARTICULATES
PM10 - PARTICULATE MATTER 10 (SIZE 10 MICRONS AND UNDER)
CO - CARBON MONOXIDE
SO2 - SULFUR DIOXIDE
WIND - WIND SPEED, WIND DIRECTION AND TEMPERATURE

TABLE 9
AQCR 141 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean	Geom Mean
Cascade/Great Falls								
0660 009 G 01	Fire Station #1	82	52	204	179	158	78.5	67.1
		83	57	163	112	105	55.2	49.6
		84	59	175	174	165	71.9	63.3
		85	55	264	225	208	78.7	65.8
		86	58	204	204	201	72.7	61.1
		87	61	228	168	124	72.6	64.7
0660 017 G 01	Downtown	82	50	107	106	105	54.2	48.7
		83	57	108	105	87	46.7	42.2
		84	51	120	93	89	50.9	45.8
		85	59	169	125	121	52.6	45.6
		86	58	167	149	135	54.7	45.8
		87	61	161	112	104	51.7	45.8
0660 017 G 07	Downtown-Collocated	82	55	104	104	93	52.5	47.4
		83	60	110	89	88	47.0	42.4
		84	61	116	115	96	51.0	45.3
		85	60	172	122	116	50.3	43.1
		86	60	171	135	132	53.8	44.6
		87	59	179	112	108	52.6	46.1
0660 019 G 01	Black Eagle PO	82	60	216	144	140	73.3	65.5
		83	58	201	171	128	63.4	55.6
		84	59	175	134	130	63.9	55.9
		85	59	225	204	150	64.3	52.6
		86	60	232	171	170	70.3	59.3
		87	36	151	132	127	67.4	59.7
0660 024 G 01	Sunnyside School	87	50	160	127	116	58.8	50.4

FIGURE 4

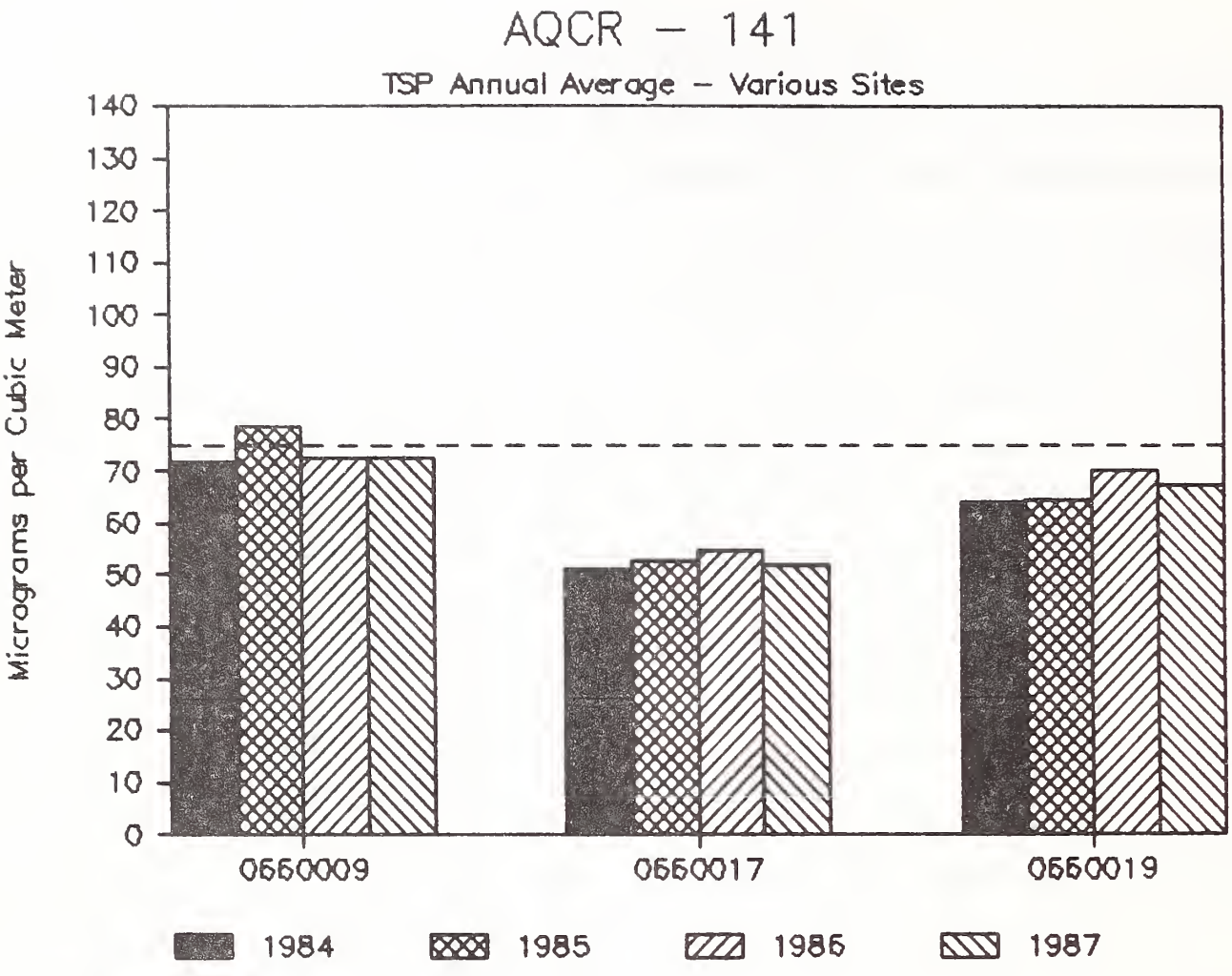

AQCR – 141
TSP Annual Average – Various Sites
Micrograms per Cubic Meter
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
0660009
0660017
0660019
1984
1985
1986
1987

TABLE 10a
AQCR 141 - CARBON MONOXIDE
Parts Per Million

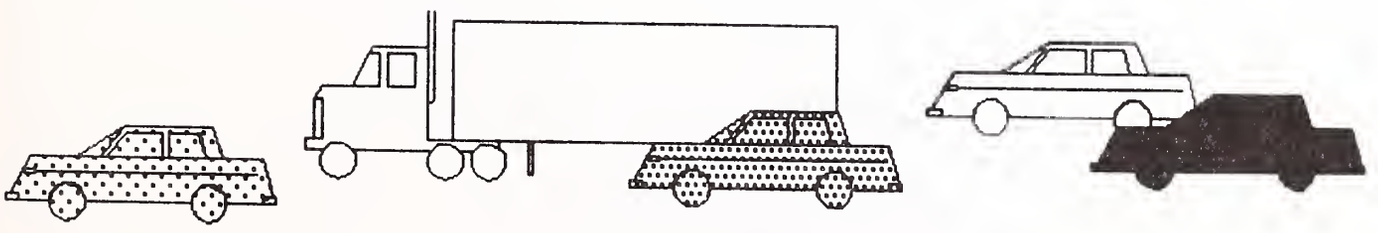
County/City Site Code/Site Name/Location	Yr	Mo	Num Obs	Max Obs	2nd Max	3rd Max	8 Hr Max	Monthly Average
Cascade/Great Falls								
0660 023 G 02 Pardis Clinic	83	01	---	---	---	---	---	---
		02	---	---	---	---	---	---
		03	---	---	---	---	---	---
		04	---	---	---	---	---	---
		05	---	---	---	---	---	---
		06	---	---	---	---	---	---
		07	---	---	---	---	---	---
		08	---	---	---	---	---	---
		09	---	---	---	---	---	---
		10	---	---	---	---	---	---
		11	500	9.0	8.7	8.3	10.3	1.6
		12	742	20.3	16.9	16.6	6.7	2.6
	ANNUAL		1242	20.3	16.9	16.6	10.3	---
0660 023 G 02 Pardis Clinic	84	01	691	9.4	7.9	7.8	5.5	1.1
		02	653	18.8	18.0	17.0	14.5	1.1
		03	738	8.7	7.0	6.9	6.6	1.8
		04	626	5.6	5.5	5.4	4.6	1.3
		05	740	6.7	5.0	3.8	3.1	0.8
		06	594	9.2	7.9	5.9	4.0	1.0
		07	736	6.9	6.4	6.3	4.4	1.3
		08	680	10.0	9.0	6.6	5.8	1.6
		09	554	8.8	6.2	5.6	4.6	1.4
		10	736	8.8	8.3	7.4	4.6	1.4
		11	716	10.6	9.0	9.0	6.3	1.1
		12	361	12.7	12.5	12.3	8.0	2.2
	ANNUAL		7825	18.8	18.0	17.0	14.5	---
0660 023 G 02 Pardis Clinic	85	01	673	10.8	10.7	10.0	8.1	2.3
		02	587	11.1	9.2	6.7	5.3	1.4
		03	738	8.0	7.4	6.9	6.1	2.1
		04	714	6.3	5.8	5.8	4.3	1.4
		05	643	6.1	5.7	5.3	3.7	1.2
		06	716	7.8	5.2	4.9	4.1	1.2
		07	739	6.0	6.0	5.7	3.5	1.6
		08	512	8.5	6.4	6.2	4.7	1.4
		09	713	8.8	7.2	6.6	5.6	1.3
		10	738	10.8	7.1	6.7	4.4	1.0
		11	712	7.8	6.7	6.4	5.2	1.5
		12	331	8.3	7.7	6.7	4.9	1.1
	ANNUAL		7817	11.1	10.8	10.8	8.1	---

TABLE 10b
AQCR 141 - CARBON MONOXIDE
Parts Per Million

County/City Site Code/Site	Name/Location	Yr	Mo	Num Obs	Max Obs	2nd Max	3rd Max	8 Hr Max	Monthly Average
0660 023 G 02	Pardis Clinic	86	01	740	17.1	15.0	12.2	8.7	1.5
			02	667	10.2	8.8	8.8	6.5	2.1
			03	739	11.0	8.0	7.8	6.3	1.4
			04	716	5.8	5.0	4.7	3.6	1.3
			05	737	6.5	5.8	5.4	4.5	1.3
			06	716	5.4	4.9	4.8	3.6	1.0
			07	739	6.8	5.2	4.7	2.8	1.0
			08	740	5.5	5.3	4.9	3.7	1.2
			09	692	7.3	6.2	5.9	5.7	1.3
			10	739	13.3	13.1	12.3	8.0	2.0
			11	714	20.6	12.6	9.8	10.0	1.4
			12	739	23.7	18.5	16.3	9.3	1.4
		ANNUAL		8678	23.7	18.5	16.3	10.0	---
0660 023 G 02	Pardis Clinic	87	01	738	14.4	11.7	10.1	6.4	1.0
			02	667	11.5	8.5	7.9	4.9	1.6
			03	644	22.4	19.0	16.3	11.9	1.4
			04	715	8.7	7.9	7.4	6.8	1.2
			05	740	5.7	5.4	5.2	4.4	1.0
			06	355	6.3	5.6	5.2	4.3	2.0
			07	566	6.3	6.1	5.9	5.4	1.2
			08	740	8.3	7.3	6.0	4.0	1.3
			09	715	11.8	11.7	11.3	6.4	1.9
			10	738	11.0	10.0	9.9	8.2	2.4
			11	714	15.4	14.5	13.2	9.6	1.9
			12	492	12.4	11.9	11.7	11.1	1.4
		ANNUAL		7824	22.4	19.0	16.3	11.9	---

TABLE 11
AQCR 141 - CO - Number of Exceedances
Parts per Million

County/City Site Code	Site Name/Location	Yr	Num Obs	Federal Prim 1-Hr 35	8-Hr 9	Montana Std 1-Hr 23	8-Hr 9
Cascade/Great Falls							
0660 023 G 02	Pardis Clinic	85	7817	0	0	0	0
		86	8678	0	2	1	2
		87	7824	0	4	0	4



Sulfation Rate

Sulfation rate was measured at one site in Toole County to monitor sulfur levels around oil/gas development near the Anabelle Sheets residence. Four sulfation plates were analyzed with a high reading of 0.10 mg SO_3/100 cm^2/ day. There is no standard for sulfation rate, but levels above 0.5 mg SO_3/100 cm^2/day indicate possible trouble spots.

Respirable Particulates (PM-10)

Particulate matter less than 10 microns (PM-10) was monitored at one site in Cascade County. The maximum 24-hour observation was 70 $\mu g/m^3$; the weighted annual average for 1987 was 26.4 $\mu g/m^3$. Table 12 summarizes the PM-10 data for this region and Table 13 shows the exceedances of the standards.

TABLE 12
AQCR 141 - RESPIRABLE PARTICULATES (PM-10)
Micrograms per Cubic Meter

County/City Site Code/Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean	Weighted Annual Average*
Cascade/Great Falls							
0660 017 G 01 Downtown	85	10	31	18	16	13.9	13.9
	86	56	73	71	63	30.1	30.1
	87	55	70	66	59	26.1	26.4

*Data from within a specified sampling period is averaged into one value. These values are then averaged within the quarter. The annual average is derived from the quarterly averages. With this method, additional sampling within a sampling period will not bias the data.

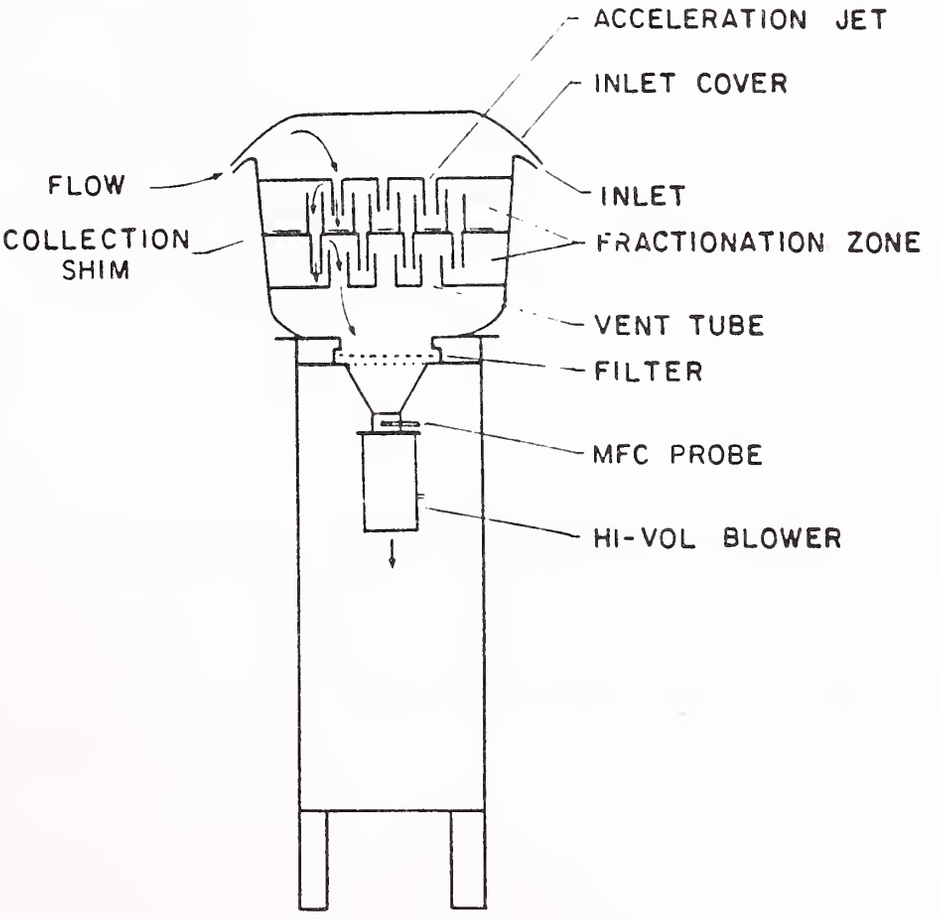


TABLE 13
AQCR 141 - PM-10 - Number of Exceedances
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Federal/State Annual Average 50	Federal/State 24-Hour >150
Cascade/Great Falls					
0660 017 G 01	Downtown	87	55	0	0

AQCR 142

Southwestern Montana

LOCATION AND PHYSICAL FEATURES

AQCR 142 is located in the southwest corner of the state. The Continental Divide borders the southern edge of the region and then cuts up through the northern portion. The region contains several distinct mountain ranges separated by fairly wide valleys. Tributaries for the Missouri, Clark Fork and Yellowstone Rivers have their beginnings in this area.

POPULATION

The 1987 estimated population of AQCR 142 was 189,400 or 23.4 percent of the state population. The main population centers in the region are in Lewis & Clark County (Helena), Gallatin County (Bozeman), and Silver Bow County (Butte).

POLLUTION SOURCES

Pollution sources and types of pollutants are listed for each county in the region. A final category lists the types of sources that would be expected in all counties in the region. The sources by county are as follows:

Beaverhead County

Sawmill (particulates)

Talc production (particulates)

Broadwater County

Sawmill (particulates)

Lime production (particulates)

Gallatin County

Cement production (particulates)

Two talc mills (particulates)

Sawmill (particulates)

Building block manufacturing (particulates)

Granite County

Sawmill (particulates)

Jefferson County

Cement production (particulates)

Two gold mines (particulates)

Lewis & Clark County

Primary lead smelter (particulates, SO_2, lead)

Paint pigment manufacturing (particulates, SO_2, VOC, metals)

Madison County

- Two talc mines (particulates)

Meagher County

- Alcohol plant (particulates)

Park County

- Solid waste incinerator (particulates)
- Several sawmills (particulates, CO)
- Gold mine (particulates)

Powell County

- Phosphate mining (particulates)
- Sawmill (particulates)

Silver Bow County

- Elemental phosphorus manufacturing (particulates, fluoride)
- Open pit copper mine (particulates)
- Gold mine (particulates)

All Counties

- Asphalt plants (particulates)
- Gravel crushers (particulates)
- Home heating devices (particulates, CO)
- Automobiles (CO, NOx, re-entrained particulates)
- Agricultural activity (particulates)
- Wind erosion (particulates)

MONITORING SITE DESCRIPTIONS

Thirteen monitoring sites were operating in this region during 1987. Table 14 lists the monitoring site descriptions. This includes site codes, site name, supporting agency, station type, project description, city name and county name, and the parameters or pollutants measured in 1987.

DATA SUMMARY

Total Suspended Particulates

TSP was monitored at eleven sites in this region. One of the sites was collocated. The maximum 24-hour observation of 248 $\mu g/m^3$ occurred in June at the Montana City School site. The second maximum of 225 $\mu g/m^3$ occurred in January at the Greeley School site in Butte. The highest annual geometric average was 70.5 $\mu g/m^3$ at the Montana City School site. Table 15 summarizes the TSP data and Figure 5 shows a four-year comparison of the annual averages for the TSP sites in this region.

Arsenic

Arsenic was analyzed from hi-vol filters at two sites in this region. The maximum 24-hour observation was 0.932 $\mu g/m^3$ at the East Helena Firehall site. There is no air pollution standard for arsenic; however, the levels are elevated above background and continue to show an impact from the mining/smelting industries. Table 16 summarizes the arsenic data for this region.

TABLE 14

AQCR 142 - MONITORING SITE DESCRIPTIONS

AREA/SITE CODE	SITE NAME/ADDRESS SUPPORTING AGENCY	STATION TYPE PROJECT DESCRIPTION	CITY COUNTY	PARAMETER
0120 002 P 01	EAST MAIN CITY BUILDING MONTANA AIR QUALITY BUREAU	CITY CENTER-COMMERCIAL POPULATION ORIENTED	BOZEMAN GALLATIN	TSP,PM10
0120 007 P 01	CHRISTIE FIELDS, 211 MASON STREET MONTANA AIR QUALITY BUREAU	SUBURBAN-RESIDENTIAL POPULATION ORIENTED	BOZEMAN GALLATIN	TSP
0160 005 P 01	GREELEY SCHOOL #1, SILVER BOW BLVD MONTANA AIR QUALITY BUREAU	CITY CENTER-RESIDENTIAL POPULATION ORIENTED	BUTTE SILVER BOW	TSP,PM10
0160 022 P 05	CONTINENTAL DRIVE & ALPINE MONTANA AIR QUALITY BUREAU	CITY CENTER-RESIDENTIAL SPECIAL STUDIES	BUTTE SILVER BOW	NEPH,DICHOT,CO,WIND
0400 004 P 02	HIWAY JUNCTION, EAST OF ANACONDA MONTANA AIR QUALITY BUREAU	RURAL-AGRICULTURAL SOURCE ORIENTED	ANACONDA DEER LODGE	TSP,ARSENIC
0720 001 P 01	COGSWELL BLDG #1 - LOCKEY AV & ROBERTS ST MONTANA AIR QUALITY BUREAU	CITY CENTER-RESIDENTIAL POPULATION ORIENTED	HELENA LEWIS & CLARK	TSP,PM10
0720 001 P 07	COGSWELL BLDG, COLOCATED HIVOL MONTANA AIR QUALITY BUREAU	CITY CENTER-RESIDENTIAL QA-COLOCATED SAMPLER	HELENA LEWIS & CLARK	PM10
0720 013 G 05	CAPITAL COURTS - 1013 DEARBORN AVE MONTANA AIR QUALITY BUREAU	SUBURBAN-COMMERCIAL SPECIAL STUDIES	HELENA LEWIS & CLARK	TSP
0760 905 P 05	MONTANA CITY SCHOOL MONTANA AIR QUALITY BUREAU	CITY CENTER-RESIDENTIAL SPECIAL STUDIES	MONTANA CITY JEFFERSON	TSP
0800 009 P 01	1065 PHILLIPS LANE MONTANA AIR QUALITY BUREAU	SUBURBAN-RESIDENTIAL POPULATION ORIENTED	HELENA LEWIS & CLARK	PM10
0860 714 P 02	FIREHALL - 2 EAST PACIFIC ST MONTANA AIR QUALITY BUREAU	CITY CENTER-RESIDENTIAL SOURCE ORIENTED	EAST HELENA LEWIS & CLARK	TSP,METALS
0860 719 P 02	HADFIELD - 101 WEST MAIN MONTANA AIR QUALITY BUREAU	SUBURBAN-INDUSTRIAL SOURCE ORIENTED	EAST HELENA LEWIS & CLARK	TSP,LEAD
0860 719 P 07	HADFIELD - COLOCATED MONTANA AIR QUALITY BUREAU	SUBURBAN-INDUSTRIAL QA-COLOCATED SAMPLER	EAST HELENA LEWIS & CLARK	TSP,LEAD
0860 724 P 02	DARTMAN FIELD - N OF EAST HELENA MONTANA AIR QUALITY BUREAU	RURAL-AGRICULTURAL SOURCE ORIENTED	EAST HELENA LEWIS & CLARK	TSP,METALS
1260 024 P 03	TERRY SMITH RANCH - 5 MI E OF OVANDO MONTANA AIR QUALITY BUREAU	RURAL-AGRICULTURAL BACKGROUND	OVANDO POWELL	TSP,PM10

PARAMETER ABBREVIATIONS:

TSP - TOTAL SUSPENDED PARTICULATES
PM10 - PARTICULATE MATTER 10 (SIZE 10 MICRONS AND UNDER)
CO - CARBON MONOXIDE
SO2 - SULFUR DIOXIDE
WIND - WIND SPEED, WIND DIRECTION & TEMPERATURE
NEPH - NEPHELOMETER MEASURES BETA (LIGHT) SCATTER
METALS - ARSENIC, CADMIUM, COPPER, TIN, LEAD, OR ZINC
DICHOT - DICHOTOMOUS SAMPLER (FINE, COARSE & TOTAL PARTICULATES)

TABLE 15a
AQCR 142 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean	Geom Mean
Deer Lodge/Anaconda								
0400 004 F 02	Hiway Junction	84	53	825	480	235	61.3	29.9
		85	113	151	73	72	28.3	22.7
		86	120	109	86	84	26.0	19.3
		87	93	97	84	83	27.8	22.7
Gallatin/Bozeman								
0120 002 F 01	East Main City Building	82	52	265	180	148	67.4	56.6
		83	46	137	136	127	67.7	59.1
		84	30	198	179	174	81.1	68.8
		85	43	202	153	151	64.7	55.7
		86	56	183	183	158	72.7	64.7
		87	42	146	112	95	58.3	53.8
0120 007 F 01	Christie Fields	85	25	62	61	50	33.2	29.6
		86	58	133	73	68	37.0	33.1
		87	41	56	55	52	30.6	26.9
Jefferson/Montana City								
0760 905 F 05	Montana City School	82	18	188	182	154	86.8	73.5
		83	35	193	175	165	80.6	68.0
		84	40	349	201	196	97.9	78.4
		85	60	259	228	221	78.5	62.5
		86	59	175	165	165	67.5	58.0
		87	59	248	170	153	79.5	70.5
Lewis and Clark/Helena								
0720 001 F 01	Cogswell Building	82	37	114	113	91	49.2	42.3
		83	55	193	165	137	48.6	41.0
		84	57	248	120	114	50.9	42.0
		85	58	273	195	189	60.5	45.8
		86	59	362	307	237	67.5	49.0
		87	42	139	109	76	43.2	37.1
0720 013 G 05	Capital Courts	82	54	183	166	122	58.6	51.3
		83	59	232	212	178	72.8	58.6
		84	54	122	116	111	52.8	45.7
		85	60	397	213	210	67.4	50.7
		86	49	225	184	161	70.9	58.6
		87	61	165	163	160	69.2	61.4

TABLE 15b
AQCR 142 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean	Geom Mean
Lewis and Clark/East Helena								
0860 714 F 02	Firehall	83	51	142	136	131	72.1	65.5
		84	115	216	206	196	75.2	65.5
		85	115	215	207	170	67.9	59.2
		86	115	209	178	173	71.3	60.4
		87	116	166	155	148	70.8	62.5
0860 719 F 02	Hadfield	82	25	133	121	113	66.7	60.8
		83	67	240	232	172	74.2	65.5
		84	116	326	301	273	85.6	70.2
		85	115	273	189	173	68.6	59.4
		86	119	259	208	193	74.1	63.5
		87	117	162	156	142	73.9	65.6
0860 719 F 07	Hadfield-Collocated	82	30	130	126	122	72.1	66.3
		83	64	239	212	192	75.6	66.7
		84	109	295	268	259	79.4	64.6
		85	115	250	182	162	66.6	58.2
		86	118	247	207	185	73.5	63.1
		87	118	170	150	137	70.5	62.2
0860 724 F 02	Dartman Field	83	42	98	95	93	46.9	40.1
		84	59	174	114	109	50.0	40.5
		85	58	113	106	101	44.0	36.4
		86	60	145	131	128	53.1	43.8
		87	59	120	113	112	53.3	45.2
Powell/Ovando								
1260 024 F 03	Terry Smith Ranch	82	56	79	79	64	20.5	14.1
		83	53	68	57	54	17.0	12.2
		84	47	231	145	97	27.8	14.8
		85	56	104	95	72	21.5	15.0
		86	59	102	72	62	23.0	17.4
		87	41	48	44	42	23.0	20.0
Silver Bow/Butte								
0160 005 F 01	Greeley School	82	46	225	216	187	70.6	57.9
		83	56	229	224	206	64.4	50.1
		84	34	193	180	129	53.3	42.7
		85	39	314	308	257	82.9	55.0
		86	51	287	274	262	90.5	67.2
		87	33	225	209	173	75.1	62.8

FIGURE 5

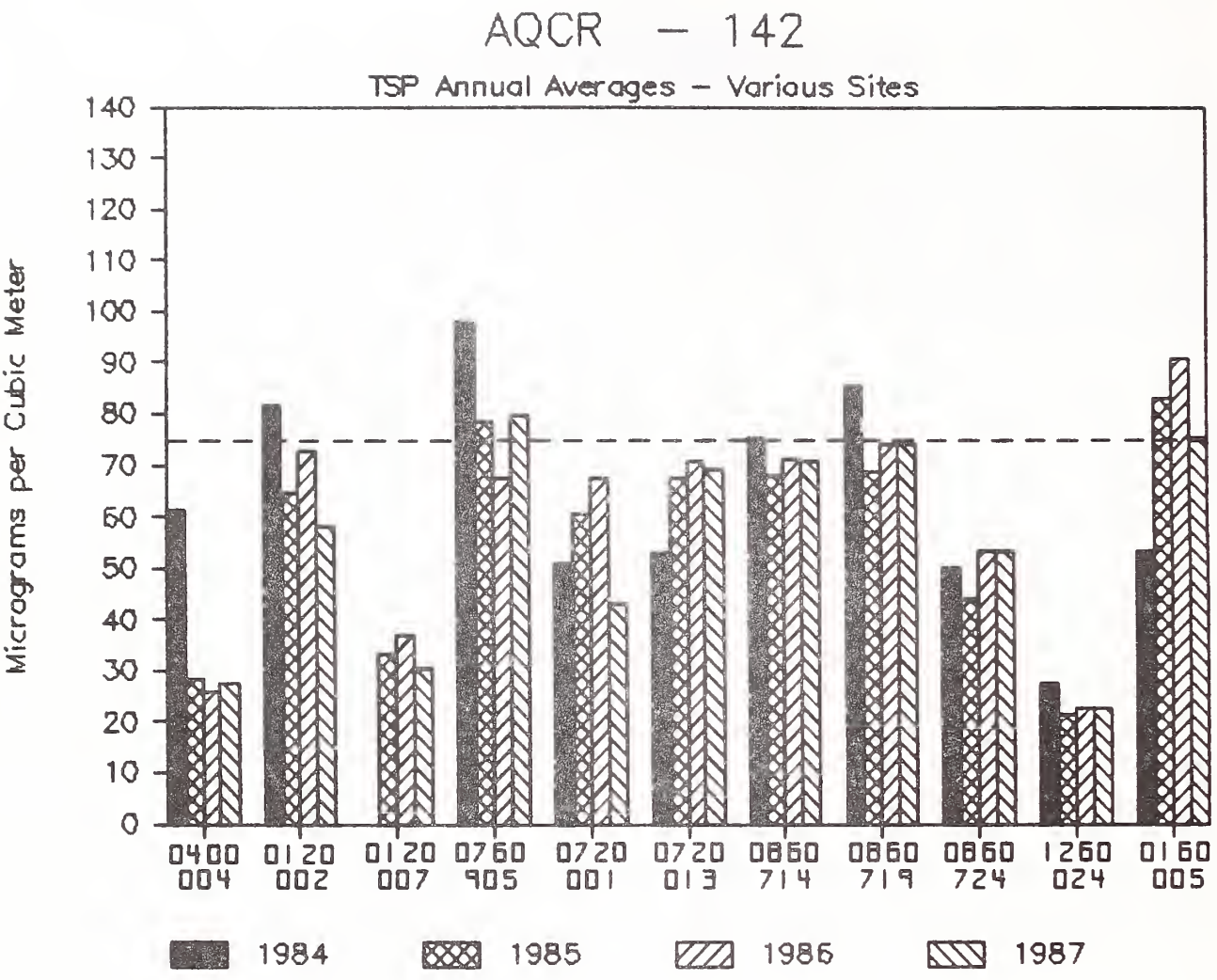
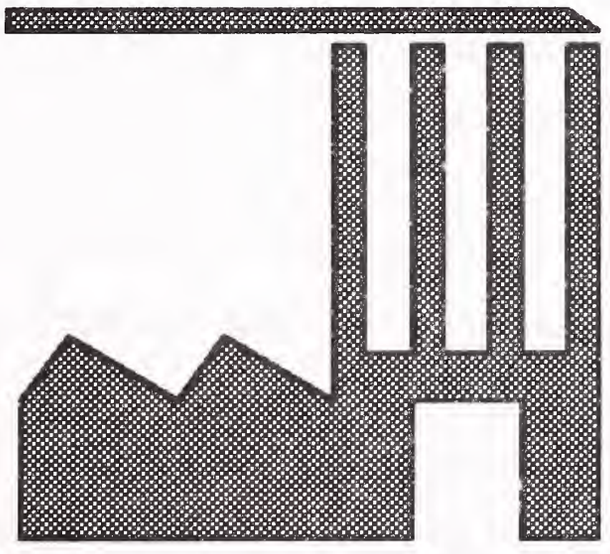

AQCR – 142
TSP Annual Averages – Various Sites
Micrograms per Cubic Meter
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
0400 004
0120 002
0120 007
0760 905
0720 001
0720 013
0860 714
0860 719
0860 724
1260 024
0160 005
1984
1985
1986
1987

TABLE 16
AQCR 142 - ARSENIC
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean
Deer Lodge/Anaconda							
0400 004 F 02	Hiway Junction	84	53	2.011	1.842	1.127	.170
		85	113	.349	.264	.259	.040
		86	120	.611	.265	.223	.033
		87	93	.200	.174	.120	.024
Lewis & Clark/East Helena							
0860 714 F 02	Firehall	87	34	.932	.702	.614	.281



Copper

Copper was analyzed from hi-vol filters at two sites in this region. The maximum 24-hour observation was 44.51 $\mu g/m^3$ at the Firehall site in East Helena. The highest annual average was 6.15 $\mu g/m^3$, at the Firehall site, represents about 10 percent by weight of the particulate concentration. There is no air pollution standard for copper. Table 17 summarizes the copper data for this region.

Lead

Lead was analyzed from hi-vol filters at three sites in the East Helena area as a continuing effort to monitor the effects of a primary lead smelter. One of the sites was collocated. The Hadfield site reported the maximum 24-hour observation of 16.42 $\mu g/m^3$. The highest annual average of 3.26 $\mu g/m^3$ occurred at the Firehall site. The annual average represents about 5 percent by weight of the particulate concentration. The highest quarterly average was 4.11 $\mu g/m^3$, also at the Firehall site. Lead concentrations at these three sites violated the federal calendar quarter standard eleven out of twelve quarters. Table 18 summarizes the daily lead data for this region; Table 19 summarizes the quarterly lead data; and Table 20 shows the number of exceedances of the lead standards. Figures 6 through 8 show a four-year comparison, by quarter, of the three lead monitoring sites.

Zinc, Cadmium and Tin

These three additional metals were analyzed from hi-vol filters at the Firehall site in East Helena. The maximum 24-hour observation for zinc was 5.19 $\mu g/m^3$. The maximum 24-hour reading for cadmium was

TABLE 17
AQCR 142 - COPPER
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean
Lewis and Clark/East Helena							
0860 714 F 02	Firehall	83	55	32.95	23.71	23.46	6.44
		84	115	86.07	45.49	33.68	7.25
		85	115	64.52	49.08	36.65	5.88
		86	116	70.72	54.37	37.09	7.98
		87	116	44.51	24.24	22.30	6.15
0860 724 F 02	Dartman Field	87	8	7.26	4.42	2.54	2.57

TABLE 18
AQCR 142 - LEAD - DAILY
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean
Lewis and Clark/East Helena							
0860 714 F 02	Firehall	83	55	16.75	13.13	12.73	5.04
		84	115	19.27	17.12	17.07	5.28
		85	115	17.08	12.99	12.98	3.34
		86	116	19.49	14.25	13.14	3.06
		87	116	12.75	11.54	10.58	3.26
0860 719 F 02	Hadfield	82	25	7.62	6.18	4.29	2.34
		83	70	8.39	7.29	7.21	3.09
		84	116	17.73	12.88	12.79	3.48
		85	115	10.08	9.05	7.59	2.18
		86	121	11.67	11.43	9.80	2.21
		87	117	16.42	13.30	6.51	2.53
0860 719 F 07	Hadfield - Collocated	82	30	7.34	6.55	5.61	2.55
		83	67	9.28	7.86	7.19	3.08
		84	109	20.43	12.58	12.03	3.23
		85	115	8.50	8.29	6.79	2.03
		86	119	11.45	11.09	10.49	2.19
		87	118	15.32	13.92	7.56	2.46
0860 724 F 02	Dartman Field	83	42	9.80	7.99	7.46	2.76
		84	59	10.96	8.34	7.85	2.69
		85	58	7.14	6.74	4.46	1.51
		86	60	7.19	6.18	5.13	1.80
		87	59	7.25	7.25	6.87	2.47

TABLE 19
AQCR 142 - LEAD--QUARTERLY
Micrograms per Cubic Meter

County/City Site Code/Site Name/Location	Yr	Jan-Mar Num Obs	Jan-Mar Arith Mean	Apr-Jun Num Obs	Apr-Jun Arith Mean	Jul-Sep Num Obs	Jul-Sep Arith Mean	Oct-Dec Num Obs	Oct-Dec Arith Mean
Lewis & Clark/East Helena									
0860 714 F 02 Firehall	83	--	--	--	--	25	4.78	30	5.25
	84	30	5.77	27	2.74	29	5.61	29	6.82
	85	29	5.46	31	3.29	25	2.25	30	2.26
	86	27	3.17	30	1.77	31	2.34	28	5.15
	87	27	3.44	28	2.35	31	3.10	30	4.11
0860 719 F 02 Hadfield	82	1	7.62	2	1.59	7	2.63	15	1.95
	83	15	3.27	2	3.20	24	3.00	29	3.07
	84	28	4.12	29	1.82	30	3.38	29	4.63
	85	30	3.19	29	2.16	28	1.86	28	1.41
	86	30	2.09	29	1.13	31	1.86	31	3.70
	87	30	3.45	28	1.92	29	1.94	30	2.76
0860 719 F 07 Hadfield - Collocated	82	1	7.34	2	2.75	11	2.68	16	2.14
	83	15	3.47	2	3.36	22	2.92	28	2.98
	84	25	3.18	26	1.80	28	3.44	30	4.31
	85	29	3.05	28	2.06	27	1.68	31	1.36
	86	30	2.00	29	1.27	31	1.81	29	3.71
	87	30	3.25	28	2.01	31	1.93	29	2.64
0860 724 F 02 Dartman Field	83	--	---	1	1.03	25	2.95	16	2.57
	84	16	3.19	15	1.26	14	3.10	14	3.23
	85	13	2.72	16	1.54	14	.61	15	1.26
	86	15	1.60	15	1.18	15	1.49	15	2.94
	87	15	2.48	15	1.28	16	2.06	13	2.84

TABLE 20
AQCR 142 - LEAD - NUMBER OF EXCEEDANCES
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Federal Prim Cal Qtr 1.5	Montana Std 90-Day 1.5
Lewis and Clark/East Helena					
0860 714 F 02	Firehall	85	115	4	4
		86	116	4	4
		87	116	4	4
0860 719 F 02	Hadfield	85	115	3	3
		86	121	3	3
		87	117	4	4
0860 724 F 02	Dartman Field	85	58	2	2
		86	60	2	2
		87	59	3	3

FIGURE 6

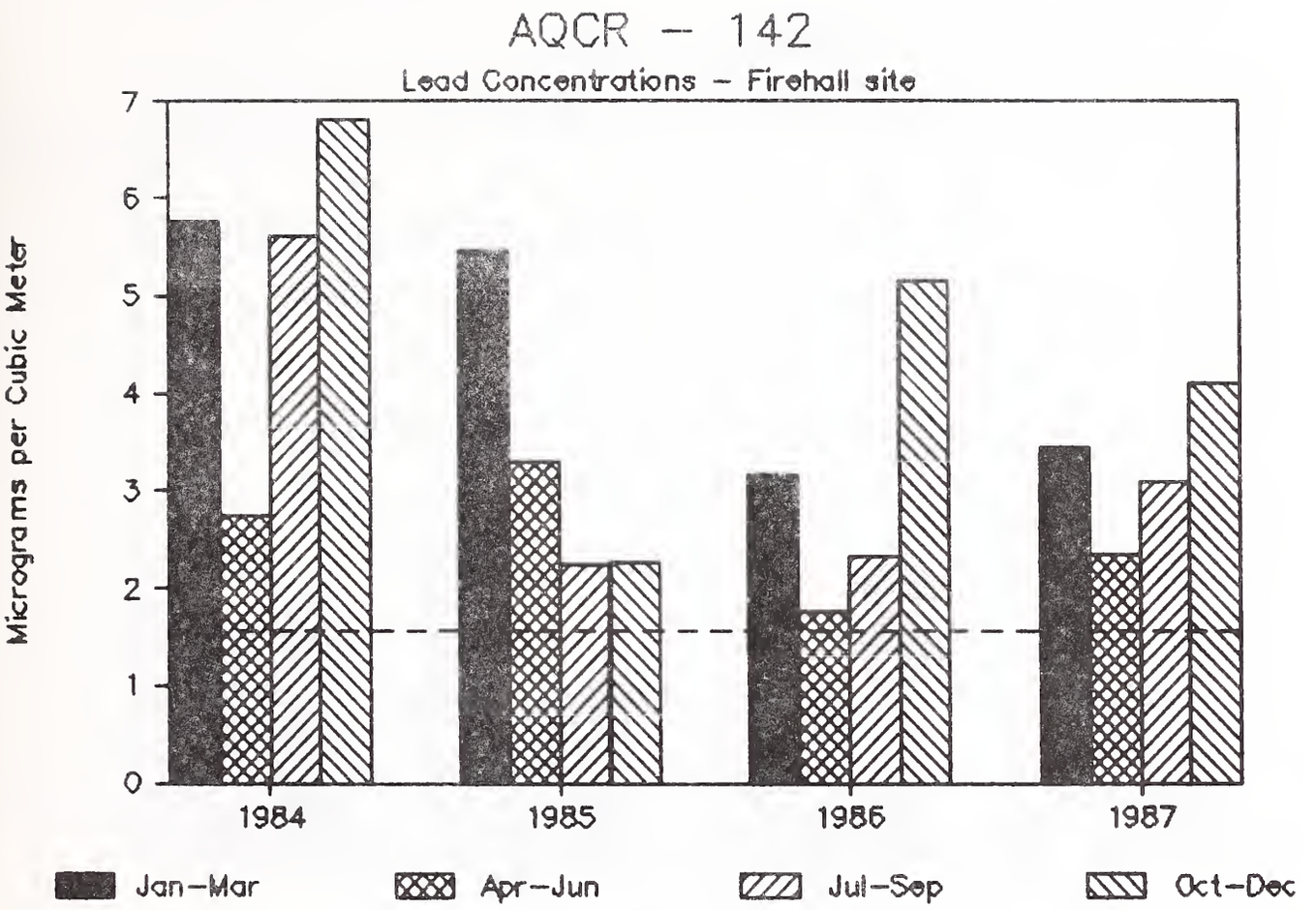


FIGURE 7

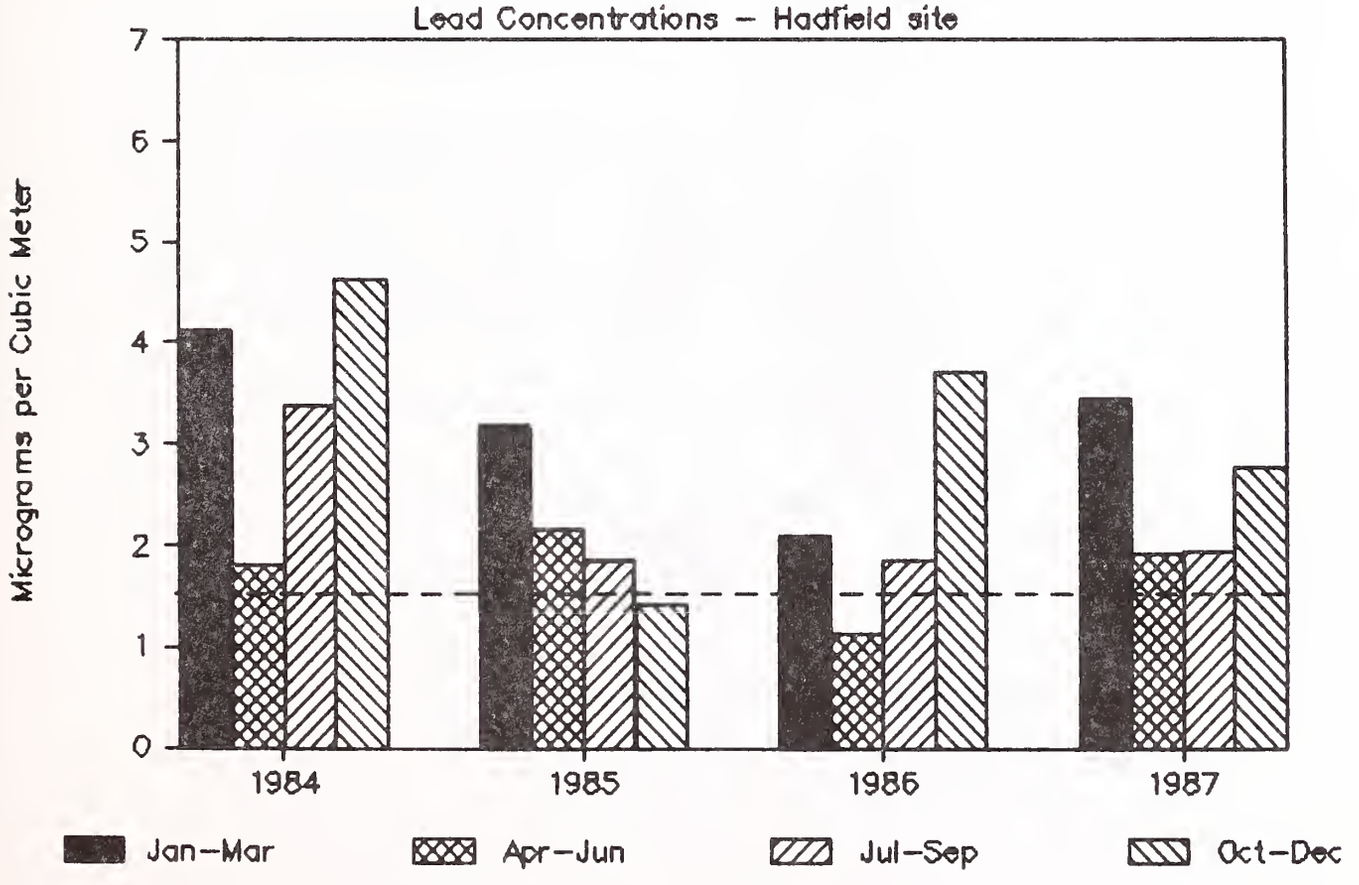
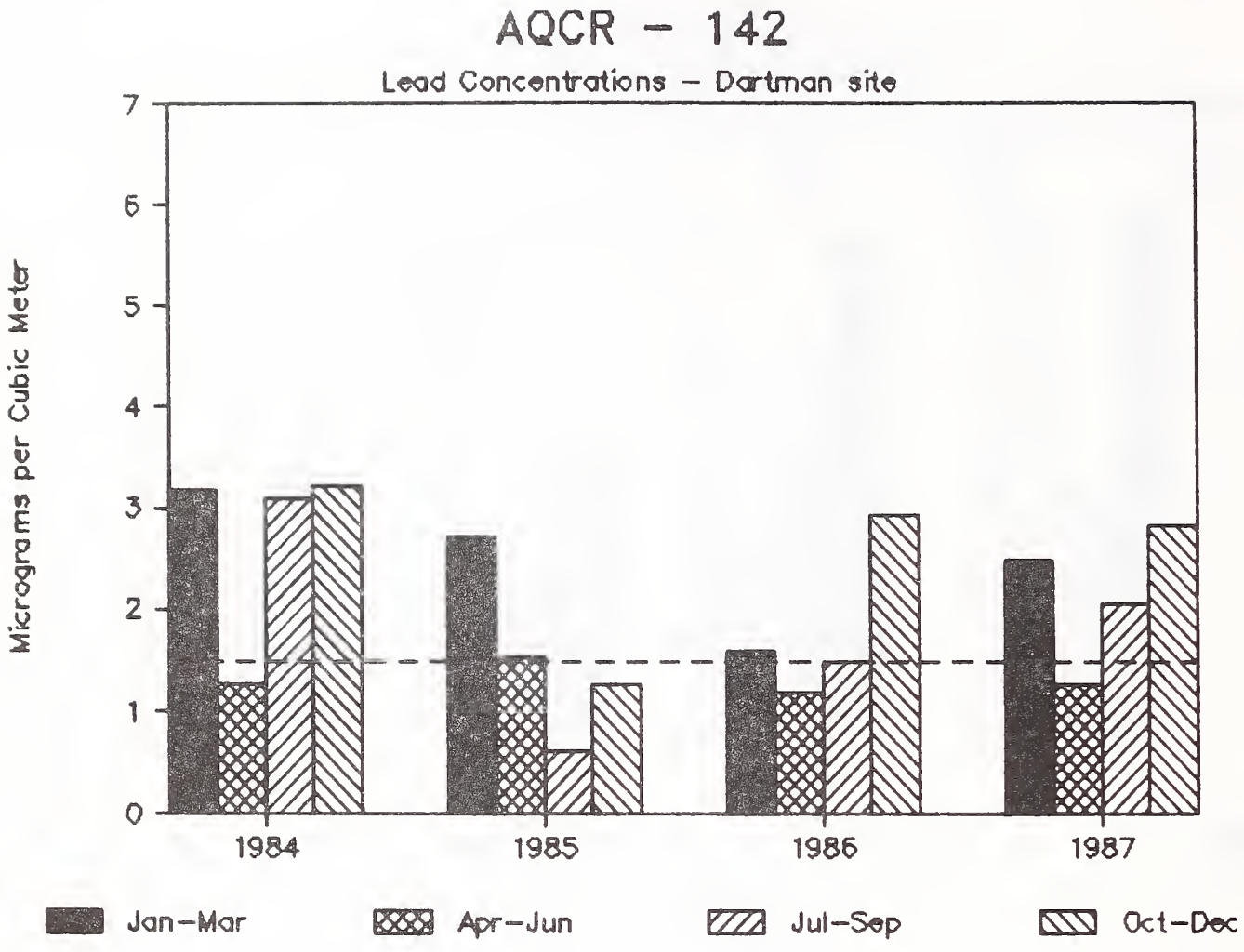


FIGURE 8

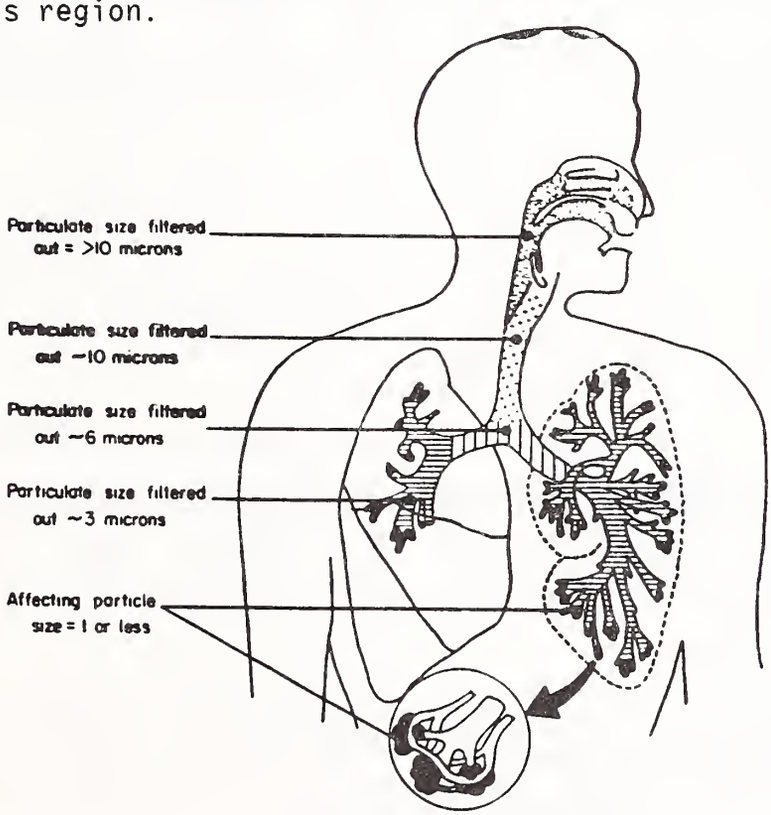

AQCR - 142
Lead Concentrations - Dartman site
Micrograms per Cubic Meter
7
6
5
4
3
2
1
0
1984
1985
1986
1987
Jan-Mar
Apr-Jun
Jul-Sep
Oct-Dec

0.631 µg/m³ and tin was 0.068 µg/m³. There are no air pollution standards for these metals. Summary statistics are given in Tables 21 through 23.

Respirable Particulates (PM-10)

Particulate matter less than 10 microns (PM-10) was monitored at five sites in this region in 1987. One of the sites was collocated. The maximum 24-hour observation of 225 µg/m³ occurred in December at the Greeley School site in Butte. Table 24 summarizes the PM-10 data for this region. The Greeley School site in Butte violated both the 24-hour and annual average standards for PM-10.

Table 25 shows the number of exceedances. Figure 9 shows a three-year comparison of the PM-10 weighted annual averages for various sites in this region.


Particulate size filtered out = >10 microns
Particulate size filtered out =10 microns
Particulate size filtered out =6 microns
Particulate size filtered out =3 microns
Affecting particle size = 1 or less

Particulate Size and the Filtration Capability of the Human Pulmonary System

TABLE 21
AQCR 142 - ZINC
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean
Lewis and Clark/East Helena							
0860 714 F 02	Firehall	83	55	6.53	6.00	4.75	1.91
		84	115	16.80	12.47	10.77	3.02
		85	115	6.86	5.79	4.71	1.55
		86	116	9.99	5.62	4.61	1.41
		87	116	5.19	4.46	4.10	1.36

TABLE 22
AQCR 142 - CADMIUM
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean
Lewis and Clark/East Helena							
0860 714 F 02	Firehall	87	34	.631	.557	.314	.144

TABLE 23
AQCR 142 - TIN
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean
Lewis and Clark/East Helena							
0860 714 F 02	Firehall	87	34	.068	.063	.054	.023

TABLE 24
AQCR 142 - RESPIRABLE PARTICULATES (PM-10)
Micrograms per Cubic Meter

County/City Site Code/Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean	Weighted Annual Average*
Gallatin/Bozeman							
0120 002 F 01 East Main City Bldg	85	6	64	52	41	42.3	40.6
	86	32	88	64	64	41.6	43.1
	87	50	61	44	43	26.7	27.0
Lewis and Clark/Helena							
0720 001 F 01 Cogswell Building	85	36	80	64	60	31.5	32.0
	86	55	140	118	105	36.5	37.3
	87	90	71	67	65	27.2	25.0
0720 001 F 07 Cogswell Bldg - Collocated	85	36	83	63	61	32.8	
	86	55	134	117	110	35.4	
	87	61	67	59	54	24.3	
0860 009 F 01 Phillips Lane	85	31	138	65	56	34.9	34.1
	86	55	118	112	95	34.8	35.3
	87	29	44	42	36	22.1	21.3
Powell/Ovando							
1260 024 F 03 Terry Smith Ranch	85	27	69	63	48	25.8	26.0
	86	51	76	61	50	18.4	19.4
	87	32	31	31	28	14.7	14.8
Silver Bow/Butte							
0160 005 F 01 Greeley School	85	28	302	235	235	86.7	47.8
	86	40	213	212	211	68.1	67.3
	87	138	225	188	186	57.1	46.2

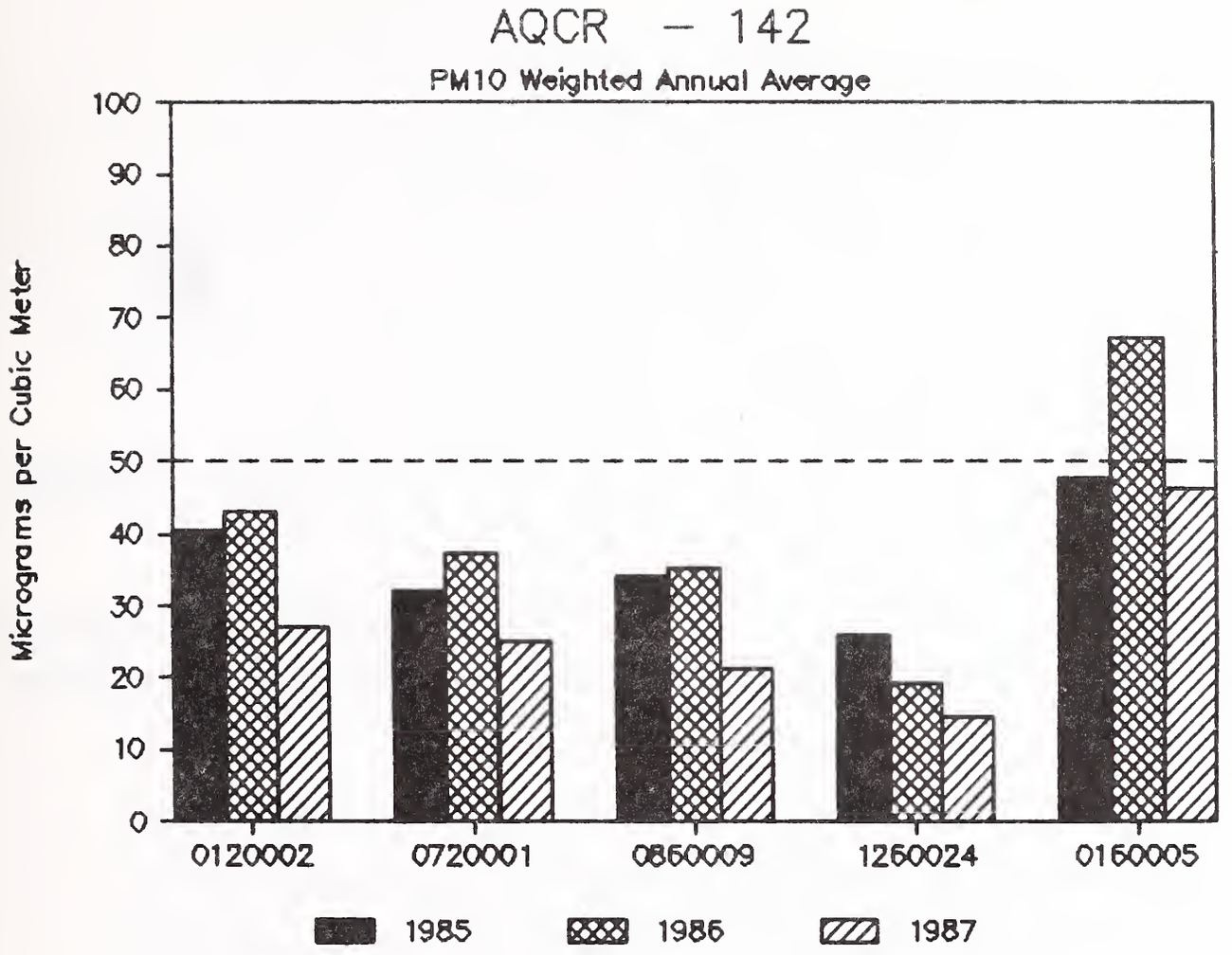
*Data from within a specified sampling period is averaged into one value. These values are then averaged within the quarter. The annual average is derived from the quarterly averages. With this method, additional sampling within a sampling period will not bias the data.

TABLE 25
AQCR 142 - PM-10 - Number of Exceedances*
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Federal/State Annual Average 50	Federal/State 24-Hour >150
Gallatin/Bozeman					
0120 002 F 01	East Main City Bldg	85	6	0	0
		86	32	0	0
		87	50	0	0
Lewis & Clark/Helena					
0720 001 F 01	Cogswell Building	85	36	0	0
		86	55	0	0
		87	90	0	0
0720 001 F 07	Cogswell Building - Collocated	85	36	0	0
		86	55	0	0
		87	61	0	0
0860 009 F 01	Phillips Lane	85	31	0	0
		86	55	0	0
		87	29	0	0
Powell/Ovando					
1260 024 F 03	Terry Smith Ranch	85	27	0	0
		86	51	0	0
		87	32	0	0
Silver Bow/Butte					
0160 005 F 01	Greeley School	85	28	0	8
		86	40	1	6
		87	138	0	6

*Violations of the PM-10 standards are determined by various criteria, taking into account sampling schedules, data recovery, 3-year averages, etc. An exceedance on this table, therefore, does not necessarily denote a violation of the PM-10 standards.

FIGURE 9


AQCR – 142
PM10 Weighted Annual Average
Micrograms per Cubic Meter
100
90
80
70
60
50
40
30
20
10
0
0120002
0720001
0860009
1260024
0160005
1985
1986
1987

AQCR 143

Eastern Montana

LOCATION AND PHYSICAL FEATURES

AQCR 143 makes up the eastern third of the state. Glaciated plains cover the northern half of the region (Missouri River area and north) while sedimentary plains cover the southern half. The Missouri River travels east to west in the northern half; the Yellowstone River travels in a northeast direction through the southern half. The two rivers meet just across the Montana border in North Dakota.

POPULATION

The 1987 estimated population of AQCR 143 was 95,200 or 11.7 percent of the state population. The people are scattered around the region in various small communities. The largest populated counties in the region are Richland (Sidney), Custer (Miles City) and Rosebud.

POLLUTION SOURCES

Pollution sources and types of pollutants are listed for each county in the region. A final category lists the types of sources that would be expected in all counties in the region. The sources by county are as follows:

Custer County

Grain elevator/feed processing (particulates)

Daniels County

Coal-fired power plant (actually in Saskatchewan, Canada) - (particulates, SO_2, NO_x)

Dawson County

Grain elevator/feed processing (particulates)

Phillips County

Two gold mines (particulates)

Richland County

Sugar beet refinery (particulates, SO_2, NOx)

Coal-fired power plant (particulates, SO_2, NOx)

Two gas sweetening plants (SO_2)

Coal strip mine (particulates)

Oil well flares and vents (SO_2, H_2S)

Roosevelt County

Oil well flares and vents (SO_2, H_2S)

Rosebud County

Two coal strip mines (particulates)

Four coal-fired power plants (particulates, SO_2, NOx)

All Counties

Asphalt plants (particulates)

Gravel crushers (particulates)

Agricultural activities (particulates)

Wind erosion (particulates)

Automobiles (CO, NO_x, re-entrained particulates)

MONITORING SITE DESCRIPTIONS

Because of the sparse population in Eastern Montana, most of the air monitoring is limited to the Sidney area (population-oriented) and the Scobey area which is downwind from a Canadian power plant. Table 26 lists the monitoring site descriptions. This includes site codes, site name, supporting agency, station type, project description, city name and county name, and the parameters or pollutants monitored during 1987.

DATA SUMMARY

Total Suspended Particulates

TSP was monitored at two sites in this region during 1987. The maximum 24-hour observation of 368 $\mu g/m^3$ occurred in April at the Sidney Downtown site. The highest annual geometric average was 53.7 $\mu g/m^3$, also at the Sidney Downtown site. The higher readings at this site occur during the spring which points to the possible influence of winds, street dust, winter sanding materials, etc. Table 27 summarizes the TSP data for this region.

TABLE 26

AQCR 143 - MONITORING SITE DESCRIPTIONS

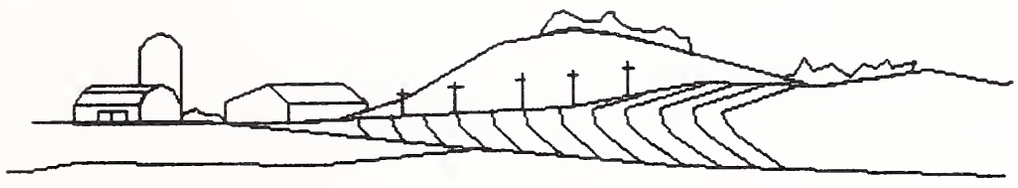
AREA/SITE CODE	SITE NAME/ADDRESS SUPPORTING AGENCY	STATION TYPE PROJECT DESCRIPTION	CITY COUNTY	PARAMETER
0340 001 F 03	SCOBEY BORDER #1, US & CANADIAN BORDER MONTANA AIR QUALITY BUREAU	RURAL-AGRICULTURAL BACKGROUND	SCOBEY DANIELS	SULFATION RATE
0340 002 F 03	RICHARDSON, 1 MILE NORTH OF SCOBEY MONTANA AIR QUALITY BUREAU	RURAL-NEAR URBAN BACKGROUND	SCOBEY DANIELS	SULFATION RATE
0340 004 F 03	HANRAHAN RANCH, NEAR WHITETAIL MONTANA AIR QUALITY BUREAU	RURAL-AGRICULTURAL BACKGROUND	SCOBEY DANIELS	SULFATION RATE
0340 004 F 07	HANRAHAN RANCH, NEAR WHITETAIL MONTANA AIR QUALITY BUREAU	RURAL-AGRICULTURAL QA-COLOCATED SAMPLER	SCOBEY DANIELS	SULFATION RATE
0340 006 F 02	FLAXVILLE MONTANA AIR QUALITY BUREAU	RURAL-NEAR URBAN SOURCE ORIENTED	FLAXVILLE DANIELS	SULFATION RATE
0340 007 F 02	TV TOWER HILL MONTANA AIR QUALITY BUREAU	RURAL-AGRICULTURAL SOURCE ORIENTED	SCOBEY DANIELS	SULFATION RATE
0340 008 F 02	SCOBEY DOWNTOWN MONTANA AIR QUALITY BUREAU	CITY CENTER-COMMERCIAL SOURCE ORIENTED	SCOBEY DANIELS	SULFATION RATE
0340 009 F 02	FOUR BUTTES MONTANA AIR QUALITY BUREAU	RURAL-AGRICULTURAL SOURCE ORIENTED	SCOBEY DANIELS	SULFATION RATE
0340 010 F 05	MARLENEE RANCH, NORTH OF SCOBEY MONTANA AIR QUALITY BUREAU	RURAL-INDUSTRIAL SPECIAL STUDIES	SCOBEY DANIELS	TSP,SO2,WIND
1320 010 F 01	SIDNEY DOWNTOWN - 115 2ND ST SE MONTANA AIR QUALITY BUREAU	RURAL-AGRICULTURAL POPULATION ORIENTED	SIDNEY RICHLAND	TSP

PARAMETER ABBREVIATIONS:

TSP - TOTAL SUSPENDED PARTICULATES
PM10 - PARTICULATE MATTER 10 (SIZE 10 MICRONS AND UNDER)
CO - CARBON MONOXIDE
SO2 - SULFUR DIOXIDE
WIND - WIND SPEED, WIND DIRECTION AND TEMPERATURE

TABLE 27
AQCR 143 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean	Geom Mean
Daniels/Scobey								
0340 010 F 05	Marlenee Ranch	86	15	140	45	44	28.9	18.7
		87	20	144	133	110	42.9	27.9
Richland/Sidney								
1320 010 F 01	Sidney Downtown	83	30	116	96	92	56.1	50.8
		84	30	233	155	132	78.1	68.0
		85	50	166	138	113	57.0	50.3
		86	27	256	140	139	74.7	56.8
		87	33	368	172	123	67.8	53.7



Sulfur Dioxide

Sulfur dioxide was monitored at the Marlenee Ranch beginning in September of 1986 and continuing for six months into 1987. In 1987, the maximum one hour reading was 0.032 ppm and the maximum three-hour average was 0.026 ppm. Monitoring was discontinued due to consistently low readings. Throughout the year of monitoring, there were no values even approaching the SO_2 standards. Table 28 summarizes the sulfur dioxide data for this region and Table 29 shows the number of exceedances.

Sulfation Rate

Because sulfur dioxide sampling was discontinued in Daniels County, sulfation rate sampling has been reinstated at seven sites. The readings remain low with a monthly maximum of 0.06 mg SO_3/100 cm^2/day and are well below the state's 0.5 guideline. Sulfation rate monitoring will be used as an indicator of sulfur dioxide levels. Sulfation rate for this region is summarized in Table 30.

Respirable Particulates (PM-10)

No PM-10 sampling was done in Eastern Montana due to the consistently low TSP readings throughout the past years.

TABLE 28
AQCR 143 - SULFUR DIOXIDE
Parts Per Million

Site Code	Site Name/Location	Yr	Mo	Num Obs	Max Obs	2nd Max	3rd Max	3 Hr Max	24 Hr Max	Mo Avg
0340 010 F 05	Scobey - Marlenee Ranch	86	01	---	---	---	---	---	---	---
			02	---	---	---	---	---	---	---
			03	---	---	---	---	---	---	---
			04	---	---	---	---	---	---	---
			05	---	---	---	---	---	---	---
			06	---	---	---	---	---	---	---
			07	---	---	---	---	---	---	---
			08	---	---	---	---	---	---	---
			09	451	.045	.030	.015	.024	.002	.000
			10	663	.075	.015	.015	.042	.002	.000
			11	663	.027	.023	.020	.018	.005	.000
			12	685	.035	.025	.015	.015	.004	.000
		ANNUAL		2462	.075	.045	.035	.042	.005	.000
0340 010 F 05	Scobey - Marlenee Ranch	87	01	661	.023	.017	.015	.013	.005	.000
			02	581	.020	.019	.018	.015	.007	.002
			03	223	.032	.025	.025	.026	.008	.005
			04	641	.014	.010	.010	.009	.008	.003
			05	735	.007	.007	.007	.006	.005	.002
			06	182	.002	.002	.002	.001	.000	.000
			07	---	---	---	---	---	---	---
			08	---	---	---	---	---	---	---
			09	---	---	---	---	---	---	---
			10	---	---	---	---	---	---	---
			11	---	---	---	---	---	---	---
			12	---	---	---	---	---	---	---
		ANNUAL		3023	.032	.025	.025	.026	.008	.002

TABLE 29
AQCR 143 - SO2 - Number of Exceedances
Parts per Million

County/City Site Code/Site Name/Location	Yr	Num Obs	Federal Prim 24-Hr 0.14	 Annual 0.03	Federal Sec 3-Hr 0.50	Montana Std 1-Hr 0.50	 24-Hr 0.10	 Annual 0.02
Daniels/Scobey								
0340 010 F 05 Marlenee	86	2462	0	0	0	0	0	0
Ranch	87	3023	0	0	0	0	0	0

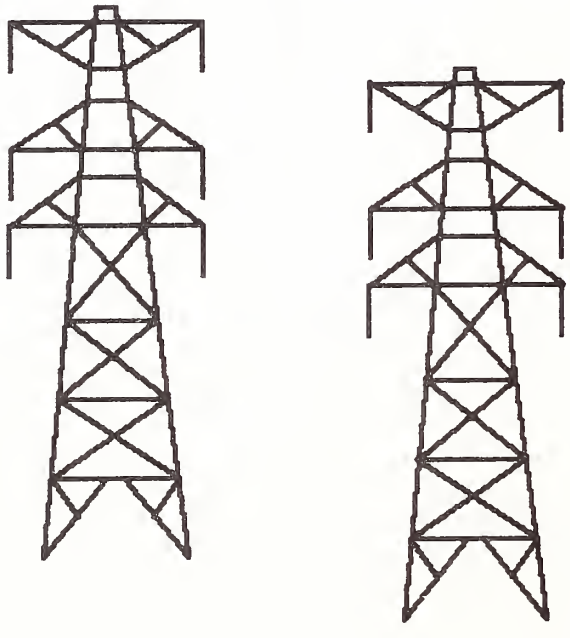


TABLE 30
AQCR 143 - SULFATION RATE
Milligrams Sulfur Trioxide per 100 Square Centimeters per Day

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean
Daniels/Scobey							
0340 001 F 03	Scobey Border #1	87	6	.05	.04	.03	.027
0340 002 F 03	Richardson	87	11	.05	.04	.03	.018
0340 004 F 03	Hanrahan	87	3	.04	.04	.02	.033
0340 006 F 02	Flaxville	87	10	.06	.04	.02	.015
0340 007 F 02	TV Tower Hill	87	11	.05	.04	.03	.019
0340 008 F 02	Scobey Downtown	87	11	.05	.04	.03	.045
0340 009 F 02	Four Buttes	87	11	.01	.01	.01	.005

AQCR 144

Northwestern Montana

LOCATION AND PHYSICAL FEATURES

AQCR 144 is located in the northwest corner of the state. The region is entirely west of the Continental Divide and contains several distinct mountain ranges separated by fairly narrow valleys. The main rivers in the region are the Clark Fork, Flathead, and Kootenai.

POPULATION

The 1987 estimated population of AQCR 144 was 214,100 or 26.4 percent of the state population. The majority of the people in this region live in Missoula County (Missoula) and Flathead County (Kalispell).

POLLUTION SOURCES

Pollution sources and types of pollutants are listed for each county in the region. A final category lists the types of sources that

would be expected in all counties in the region. The sources by county are as follows:

Flathead County

- Aluminum reduction plant (particulates, fluorides)
- Two plywood plants (particulates)
- Particleboard plant (particulates)
- Several sawmills (particulates)

Lake County

- Two sawmills (particulates)

Lincoln County

- Copper/silver mine (particulates)
- Vermiculite mine (particulates)
- Plywood plant (particulates)
- Sawmills (particulates)

Mineral County

- Two sawmills (particulates)

Missoula County

- Plywood plant (particulates)
- Particleboard plant (particulates)
- Several sawmills (particulates)
- Kraft pulp mill (particulates, H_2S, SO_2, NOx)

Ravalli County

- Two sawmills (particulates)

Sanders County

- Three sawmills (particulates)
- Antimony mine and mill (particulates)

All Counties

Asphalt plants (particulates)

Gravel crushers (particulates)

Automobiles (particulates, CO)

Slash and open burning (particulates, CO)

Residential wood burning (particulates, CO)

Agricultural activities (particulates)

MONITORING SITE DESCRIPTIONS

Due to the geographical and meteorological influence of this region's mountain valleys, the most intensive air monitoring was done in this AQCR. These areas tend to be affected by frequent temperature inversions during the winter and are the most resistant to control measures. Table 31 lists the monitoring site descriptions. This includes site codes, site name, supporting agency, station type, project description, city name and county name, and the parameters or pollutants monitored in 1987.

DATA SUMMARY

Total Suspended Particulates

TSP was monitored at seventeen sites in this region in 1987. Four of the sites were collocated. The maximum 24-hour observation of 604 $\mu g/m^3$ occurred in February at the Sanders County Courthouse site in Thompson Falls. The Sanders County Courthouse site had both the highest annual geometric average of 96.9 $\mu g/m^3$ and the highest annual arithmetic average of 126.0 $\mu g/m^3$.

TABLE 31a

AQCR 144 - MONITORING SITE DESCRIPTIONS

AREA SITE CODE	SITE NAME/ADDRESS SUPPORTING AGENCY	STATION TYPE PROJECT DESCRIPTION	CITY COUNTY	PARAMETER
0270 003 F 01	JR HIGH SCHOOL, 500 4TH AVENUE NORTH MONTANA AIR QUALITY BUREAU	SUBURBAN-RESIDENTIAL POPULATION ORIENTED	COLUMBIA FALLS FLATHEAD	TSP,PM10
0270 005 F 01	ANDERS RESIDENCE, 726 FIRST STREET MONTANA AIR QUALITY BUREAU	CITY CENTER-RESIDENTIAL POPULATION ORIENTED	COLUMBIA FALLS FLATHEAD	TSP
0270 006 F 05	981 2ND STREET (LABERE) MONTANA AIR QUALITY BUREAU	SUBURBAN-RESIDENTIAL SPECIAL STUDIES	COLUMBIA FALLS FLATHEAD	DUSTFALL, COMBUSTIBLE DUSTFALL
0800 015 F 01	UNIVERSAL ATHLETIC - 226 MAIN STREET MONTANA AIR QUALITY BUREAU	SUBURBAN-COMMERCIAL POPULATION ORIENTED	KALISPELL FLATHEAD	TSP,PM10,DICHOT
0800 018 F 05	PETERSON SCHOOL, 3RD ST WEST & MERIDIAN MONTANA AIR QUALITY BUREAU	CITY CENTER-RESIDENTIAL SPECIAL STUDIES	KALISPELL FLATHEAD	TSP,DICHOT
0900 012 F 01	LINCOLN CO COURTHOUSE, 418 MINERAL AVE MONTANA AIR QUALITY BUREAU	CITY CENTER-COMMERCIAL POPULATION ORIENTED	LIBBY LINCOLN	TSP,PM10
0900 012 F 07	LINCOLN CO COURTHOUSE - COLOCATED MONTANA AIR QUALITY BUREAU	CITY CENTER-COMMERCIAL QA-COLOCATED SAMPLER	LIBBY LINCOLN	TSP,PM10
0900 017 F 05	HORELICK RESIDENCE, 707 MICHIGAN AVENUE MONTANA AIR QUALITY BUREAU	CITY CENTER-INDUSTRIAL SPECIAL STUDIES	LIBBY LINCOLN	DUSTFALL, COMBUSTIBLE DUSTFALL
0900 018 F 05	COUNTY COURTHOUSE ANNEX MONTANA AIR QUALITY BUREAU	CITY CENTER-RESIDENTIAL SPECIAL STUDIES	LIBBY LINCOLN	NEPH,WIND
0900 019 F 05	COURTHOUSE PARKING LOT MONTANA AIR QUALITY BUREAU	CITY CENTER-RESIDENTIAL SPECIAL STUDIES	LIBBY LINCOLN	DICHOT
0940 005 F 01	LINCOLN ELECTRIC CO-OP - S OF HIWAY 93 MONTANA AIR QUALITY BUREAU	RURAL-COMMERCIAL POPULATION ORIENTED	EUREKA LINCOLN	TSP,PM10
0940 007 F 05	KENDALL FIELD, 381 FARM TO MARKET ROAD MONTANA AIR QUALITY BUREAU	SUBURBAN-RESIDENTIAL SPECIAL STUDIES	LIBBY LINCOLN	TSP,PM10
1060 001 F 05	COX RESIDENCE MONTANA AIR QUALITY BUREAU	RURAL-INDUSTRIAL SPECIAL STUDIES	ST. REGIS MINERAL	DUSTFALL, COMBUSTIBLE DUSTFALL
1080 005 G 02	MALFUNCTION JCT, SOUTH, BROOKS, RUSSELL MISSOULA CITY/COUNTY HEALTH DEPARTMENT	CITY CENTER-COMMERCIAL SOURCE ORIENTED	MISSOULA MISSOULA	CO,WIND
1100 015 G 02	STONE CONTAINER #1-RAILROAD BLUFF MISSOULA CITY-COUNTY HEALTH DEPARTMENT	RURAL-INDUSTRIAL SOURCE ORIENTED	MISSOULA MISSOULA	TSP
1100 015 G 07	STONE CONTAINER #1-RAILROAD BLUFF-COLLOC MISSOULA CITY-COUNTY HEALTH DEPARTMENT	RURAL-INDUSTRIAL QA-COLOCATED SAMPLER	MISSOULA MISSOULA	TSP
1100 016 G 02	STONE CONTAINER #2-WELL FIELD MISSOULA CITY-COUNTY HEALTH DEPARTMENT	RURAL-INDUSTRIAL SOURCE ORIENTED	MISSOULA MISSOULA	TSP

TABLE 31b

AQCR 144 - MONITORING SITE DESCRIPTIONS

AREA/SITE CODE	SITE NAME/ADDRESS SUPPORTING AGENCY	STATION TYPE PROJECT DESCRIPTION	CITY COUNTY	PARAMETER
1100 020 G 01	ROSE PARK - 1/2 BLOCK FROM HIWAY 93 S MISSOULA CITY-COUNTY HEALTH DEPARTMENT	CITY CENTER-RESIDENTIAL POPULATION ORIENTED	MISSOULA MISSOULA	TSP,PM10
1100 024 G 01	BOYD PARK, WASHBURN & ERNEST MISSOULA CITY-COUNTY HEALTH DEPARTMENT	SUBURBAN-RESIDENTIAL POPULATION ORIENTED	MISSOULA MISSOULA	CO,TSP,PM10
1100 024 G 07	BOYD PARK, COLLOCATED MISSOULA CITY-COUNTY HEALTH DEPARTMENT	SUBURBAN-RESIDENTIAL POPULATION ORIENTED	MISSOULA MISSOULA	PM10
1100 031 G 01	HEALTH DEPARTMENT, 301 WEST ALDER MISSOULA COUNTY HEALTH DEPARTMENT	CITY CENTER-COMMERCIAL POPULATION ORIENTED	MISSOULA MISSOULA	TSP,PM10
1100 031 G 07	HEALTH DEPARTMENT ROOF, 301 W ALDER MISSOULA COUNTY HEALTH DEPARTMENT	CITY CENTER-COMMERCIAL QA-COLOCATED SAMPLER	MISSOULA MISSOULA	TSP
1100 032 G 01	RATTLESNAKE GRADE SCHOOL, 120 PINEVIEW MISSOULA CITY/COUNTY HEALTH DEPARTMENT	SUBURBAN-RESIDENTIAL POPULATION ORIENTED	MISSOULA MISSOULA	TSP
1100 033 G 01	MOUNT JUMBO GRADE SCHOOL MISSOULA CITY COUNTY HEALTH DEPARTMENT	SUBURBAN-RESIDENTIAL POPULATION ORIENTED	EAST MISSOULA MISSOULA	PM10
1100 034 G 02	STONE CONTAINER #1A - MOCCASIN LANE MISSOULA COUNTY	RURAL-INDUSTRIAL SOURCE ORIENTED	FRENCHTOWN MISSOULA	TSP
1100 034 G 07	STONE CONTAINER #1A - COLLOCATED MISSOULA COUNTY	RURAL-INDUSTRIAL QA-COLOCATED SAMPLER	FRENCHTOWN MISSOULA	TSP
1300 001 F 01	RAVALLI COUNTY COURTHOUSE - 205 BEDFORD MONTANA AIR QUALITY BUREAU	CITY CENTER-COMMERCIAL POPULATION ORIENTED	HAMILTON RAVALLI	TSP,PM10
1400 003 F 01	SANDERS COUNTY COURTHOUSE MONTANA AIR QUALITY BUREAU	CITY CENTER-COMMERCIAL POPULATION ORIENTED	THOMPSON FALLS SANDERS	TSP,PM10

PARAMETER ABBREVIATIONS:

TSP - TOTAL SUSPENDED PARTICULATES
PM10 - PARTICULATE MATTER 10 (SIZE 10 MICRONS AND UNDER)
CO - CARBON MONOXIDE
SO2 - SULFUR DIOXIDE
WIND - WIND SPEED, WIND DIRECTION AND TEMPERATURE
NEPH - NEPHELOMETER MEASURES BETA (LIGHT) SCATTER
DICHOT - DICHOTOMOUS SAMPLER (FINE, COARSE AND TOTAL PARTICULATES)

Particulate matter readings in western Montana are often high due to emissions from paved and unpaved roads, wood stoves, and industrial sources. Other major influences are the meteorological and physical features of the region (calm winds, inversions, and narrow valleys) which cause pollutants to be trapped and concentrations to increase. Table 32 summarizes the TSP data for this region. Figure 10 shows a four-year comparison of the annual averages for most of the TSP sites in this region.

Visibility

Visibility was measured with an integrating nephelometer at one site in this region in 1987. The maximum hourly observation was 100.0 x 10^{-5} particle scattering coefficient per meter at the Libby Courthouse Annex site. These high readings occurred throughout the fall and winter months. The annual average was 21.76 x 10^{-5} particle scattering coefficient per meter. The annual standard of 3 x 10^{-5} applies only to PSD Class I areas. This sampler was run in conjunction with the department's smoke management program.

Montana's Smoke Management Plan is a cooperative effort of various air pollution and government agencies, the U.S. Forest Service and several industries to minimize or prevent the accumulation of smoke in Montana when prescribed burning is necessary. Burning activities are planned and coordinated in the fall months. Weather conditions are monitored and burning restrictions are issued when smoke dispersion and atmospheric conditions are expected to exceed acceptable levels.

TABLE 32a
AQCR 144 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean	Geom Mean
Flathead/Columbia Falls								
0270 003 F 01	Columbia Falls Jr. High	85	13	151	121	100	56.6	43.4
		86	49	326	256	167	93.1	79.3
		87	33	239	236	206	101.3	89.8
0270 005 F 01	Anders Residence	82	60	241	225	186	85.4	67.0
		83	58	274	199	178	81.6	70.1
		84	60	437	407	302	115.1	90.6
		85	60	355	260	240	86.7	66.5
		86	59	519	416	297	101.4	81.8
		87	41	424	271	258	108.8	90.0
Flathead/Kalispell								
0800 015 F 01	Universal Athletics	82	59	234	232	201	85.0	73.6
		83	48	370	210	186	84.9	72.4
		84	39	209	196	152	80.7	73.3
		85	51	441	432	263	101.9	79.1
		86	56	509	371	335	105.6	86.3
		87	39	305	265	251	110.6	93.1
0800 018 F 05	Peterson School	86	22	101	82	80	52.6	49.5
		87	39	164	157	155	77.6	70.4
Lincoln/Libby								
0900 012 F 01	Lincoln County Crthse.	83	50	278	207	207	106.1	90.4
		84	54	463	364	354	121.7	102.5
		85	56	642	438	392	122.2	99.6
		86	57	572	488	347	133.6	109.0
		87	41	458	352	263	119.4	96.7
0900 012 F 07	Lincoln Co.Crthse.- Collocated	84	16	281	194	142	114.6	103.1
		85	53	638	471	407	132.7	107.2
		86	57	554	466	339	132.1	107.9
		87	40	465	353	261	121.7	98.7
Lincoln/Eureka								
0940 005 F 01	Lincoln Electric Co-op	84	33	349	276	149	86.1	64.2
		85	43	190	159	155	69.1	58.5
		86	49	387	349	331	109.2	80.3
		87	49	318	223	216	91.5	76.7

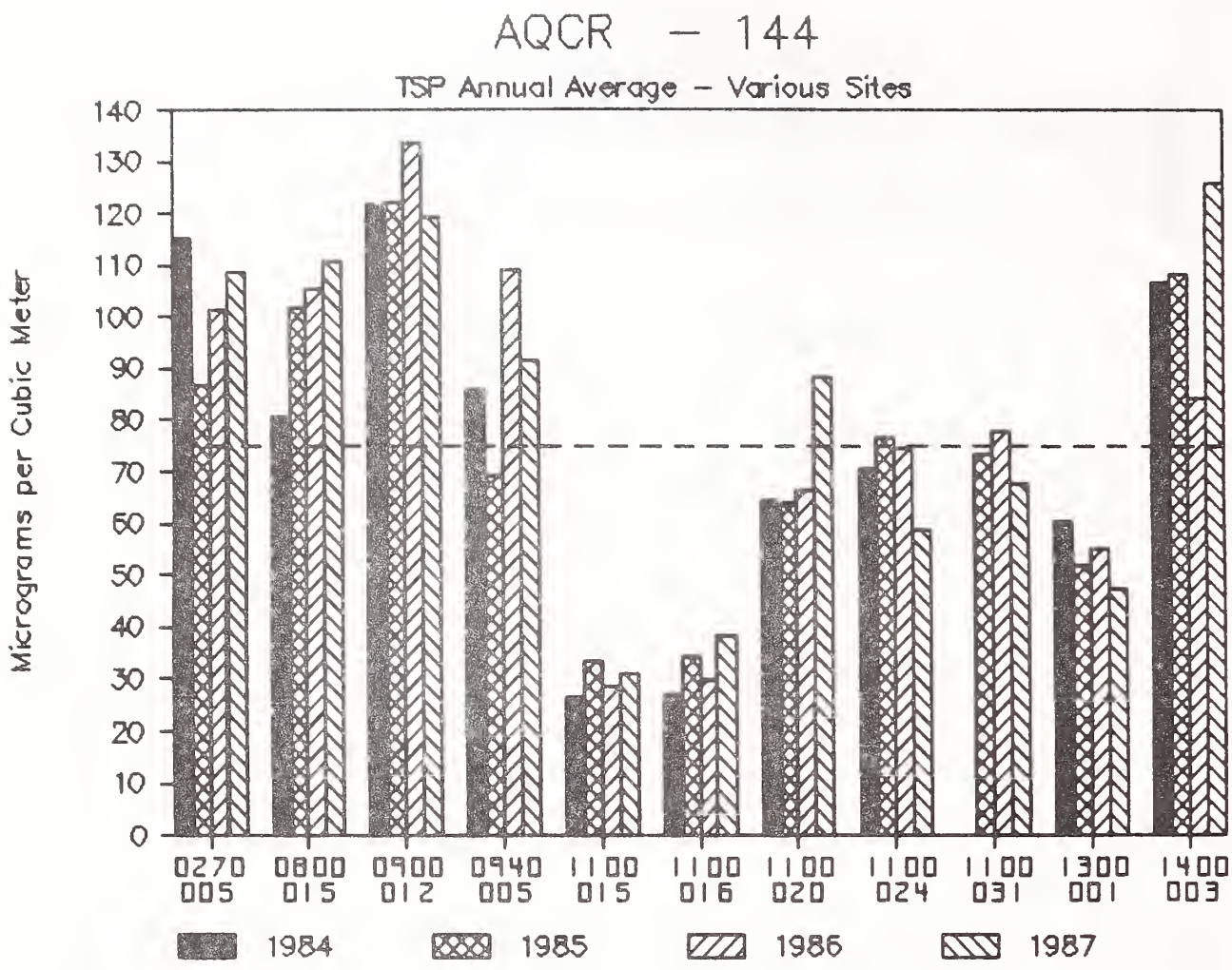
TABLE 32b
AQCR 144 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean	Geom Mean
Lincoln/Eureka								
0940 007 F 05	Kendall Field	87	22	121	102	81	54.4	48.6
Missoula/Missoula								
1100 015 G 02	Stone Container #1	82	113	101	86	70	31.9	26.3
		83	104	80	69	68	29.5	25.8
		84	114	94	92	85	26.7	21.7
		85	100	111	91	87	33.6	28.3
		86	83	88	81	64	28.8	23.2
1100 015 G 07	Stone Container #1-Collocated	82	45	65	64	63	32.0	27.5
		83	58	78	67	65	29.0	25.2
		84	60	54	52	49	25.0	21.5
		85	45	76	70	63	33.3	29.6
		86	51	80	64	61	31.1	25.9
		87	27	97	80	73	34.1	26.7
1100 016 G 02	Stone Container #2	82	118	109	105	83	33.1	26.7
		83	102	143	101	70	20.7	24.1
		84	119	102	99	89	26.8	20.3
		85	90	105	87	87	34.2	27.6
		86	90	109	107	70	29.7	22.3
		87	97	141	135	126	38.4	28.7
1100 020 G 01	Rose Park	82	351	381	312	221	64.6	55.2
		83	347	422	346	280	67.7	55.9
		84	346	294	264	257	64.5	53.6
		85	338	340	261	243	63.9	53.1
		86	341	373	351	342	66.5	52.4
		87	112	463	281	256	88.5	72.5
1100 024 G 01	Boyd Park	82	116	319	309	298	89.2	72.9
		83	139	366	336	321	88.3	72.7
		84	341	440	408	343	70.7	56.5
		85	315	309	301	289	76.5	62.5
		86	299	411	385	289	74.5	58.8
		87	156	293	235	219	58.8	47.7
1100 031 G 01	Health Department	85	331	305	275	268	73.4	61.7
		86	329	363	351	324	77.7	63.5
		87	164	302	190	162	67.8	59.2
1100 031 G 07	Health Dept.-Collocated	85	100	227	204	188	67.9	57.8
		86	108	377	335	274	79.9	64.5
		87	61	155	148	140	68.8	60.3

TABLE 32c
AQCR 144 - TOTAL SUSPENDED PARTICULATES
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean	Geom Mean
Missoula/Missoula								
1100 032 G 01	Rattlesnake School	86	44	101	98	97	35.7	27.9
		87	25	70	66	65	41.3	37.7
1100 034 G 02	Stone Container #1A	87	13	90	84	71	43.2	33.4
1100 034 G 07	Stone Container #1A-Collocated	87	7	111	76	69	53.9	43.0
Ravalli/Hamilton								
1300 001 F 01	Ravalli County Crthse.	83	43	181	164	126	66.6	58.6
		84	51	267	185	149	60.2	49.4
		85	53	133	130	127	52.0	45.0
		86	58	229	158	126	55.2	45.5
		87	35	126	119	97	47.2	40.9
Sanders/Thompson Falls								
1400 003 F 01	Sanders County Crthse.	83	45	358	260	257	89.8	72.3
		84	47	388	370	360	106.7	81.0
		85	48	604	362	362	108.3	81.0
		86	48	273	233	172	84.2	71.1
		87	31	604	343	245	126.0	96.9

FIGURE 10


AQCR – 144
TSP Annual Average – Various Sites
Micrograms per Cubic Meter
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
0270 005
0800 015
0900 012
0940 005
1100 015
1100 016
1100 020
1100 024
1100 031
1300 001
1400 003
1984
1985
1986
1987

The smoke management group publishes an annual report each year which more fully describes the program. Table 33 summarizes the visibility data for this region.

Carbon Monoxide

Carbon monoxide was monitored at two sites in the region in 1987: Malfunction Junction and Boyd Park in Missoula. Both the maximum hourly observation of 22.6 ppm and the maximum eight hour observation of 10.9 ppm occurred at Boyd Park. There was one violation of the 8-hour standard at the Boyd Park site and six violations of the 8-hour standard at Malfunction Junction. Sources that contribute to CO are automotive exhaust, wood stoves, and fireplaces. Table 34 summarizes the carbon monoxide data for this region and Table 35 shows the number of exceedances.

Respirable Particulates (PM-10)

Particulate matter less than 10 microns (PM-10) was monitored at eleven sites in this region in 1987. Two of the sites were collocated. The maximum 24-hour observation was 276 $\mu g/m^3$ at Rose Park in Missoula. The highest weighted annual average was 79.1 at the Lincoln County Courthouse in Libby. Over half of the 13 sites violated the 24-hour PM-10 standard and several violated the annual average. The compliance status of these communities and their progress toward attainment of the standards is outlined in Appendix F. Table 36 summarizes the PM-10 data and Table 37 lists the exceedances of the PM-10 standards. Figure 11 graphs the weighted annual average for these sites for the last three years.

TABLE 33
AQCR 144 - BETA (LIGHT) SCATTER
Scattering Coefficient (X 10**5)

Site Code	Site Name/Location	Yr	Mo	Num Obs	Max Obs	2nd Max	3rd Max	Monthly Average
0900 018 F 05	Libby - Courthouse Annex	87	01	715	100.0	100.0	100.0	44.9
			02	672	100.0	100.0	100.0	35.2
			03	736	100.0	100.0	100.0	33.1
			04	713	72.0	61.6	61.4	16.6
			05	739	27.5	26.5	23.0	7.0
			06	714	30.0	29.9	27.9	7.2
			07	744	46.3	39.0	32.0	6.9
			08	743	51.6	42.5	29.5	6.6
			09	463	59.0	57.0	50.0	9.9
			10	533	100.0	100.0	100.0	36.7
			11	648	81.0	81.0	80.0	32.5
			12	739	98.0	91.0	81.0	27.3
		ANNUAL		8159	100.0	100.0	100.0	21.76

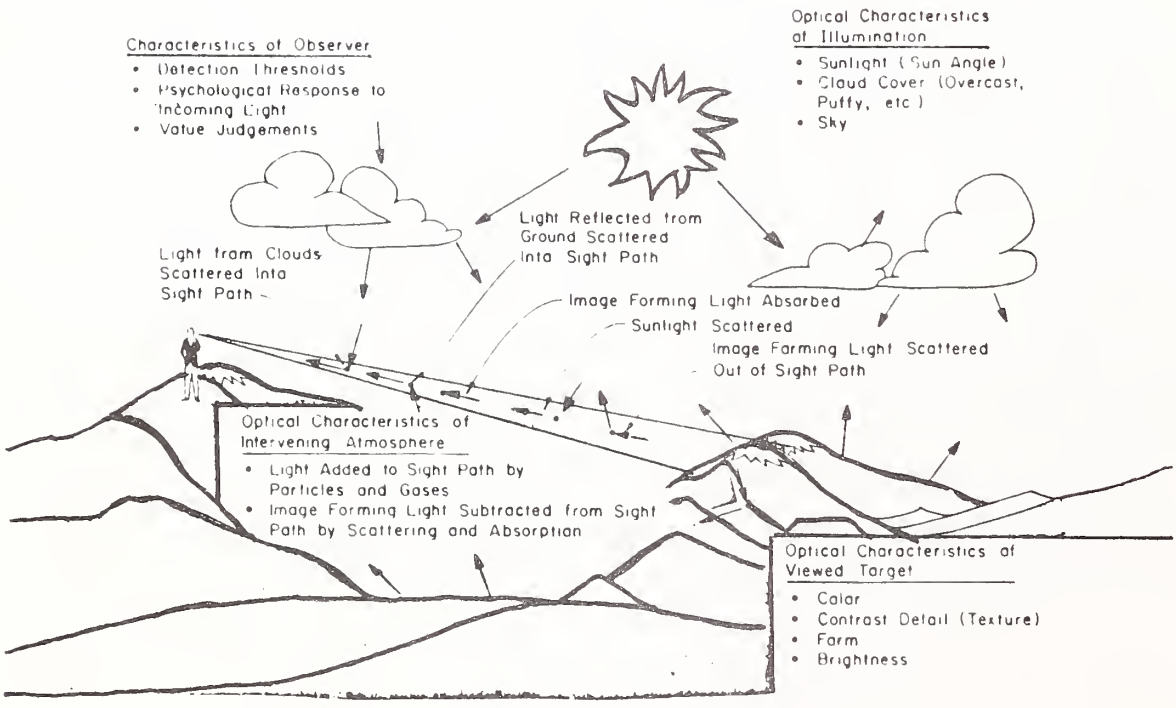

Characteristics of Observer
• Detection Thresholds
• Psychological Response to Incoming Light
• Value Judgements
Optical Characteristics of Illumination
• Sunlight (Sun Angle)
• Cloud Cover (Overcast, Puffy, etc.)
• Sky
Light Reflected from Ground Scattered Into Sight Path
Light from Clouds Scattered Into Sight Path
Image Forming Light Absorbed
Sunlight Scattered
Image Forming Light Scattered Out of Sight Path
Optical Characteristics of Intervening Atmosphere
• Light Added to Sight Path by Particles and Gases
• Image Forming Light Subtracted from Sight Path by Scattering and Absorption
Optical Characteristics of Viewed Target
• Color
• Contrast Detail (Texture)
• Form
• Brightness

TABLE 34a
AQCR 144 - CARBON MONOXIDE
Parts Per Million

County/City Site Code/Site Name/Location	Yr	Mo	Num Obs	Max Obs	2nd Max	3rd Max	8 Hr Max	Monthly Average
Missoula/Missoula								
1080 005 G 02 Malfunction Jct.	86	01	---	---	---	---	---	---
		02	284	10.9	10.4	10.3	8.7	3.1
		03	634	8.8	8.8	8.7	8.8	2.9
		04	393	6.3	6.3	5.5	4.6	1.7
		05	520	6.0	6.0	5.4	4.0	1.7
		06	522	6.5	6.0	5.6	4.4	2.0
		07	262	6.2	5.2	5.1	3.7	1.6
		08	676	7.6	6.9	6.9	4.8	1.7
		09	363	10.4	8.0	8.0	5.6	2.0
		10	582	10.8	10.2	9.8	6.4	2.2
		11	207	11.7	9.6	9.6	7.5	3.1
		12	654	24.5	17.1	12.5	10.0	3.5
	ANNUAL		5097	24.5	17.1	12.5	10.0	---
1080 005 G 02 Malfunction Jct.	87	01	523	16.1	13.0	12.9	8.5	3.7
		02	668	21.6	15.8	13.7	10.6	3.3
		03	703	10.2	9.7	8.4	7.1	2.1
		04	680	7.5	7.4	6.4	4.5	1.8
		05	239	6.1	4.9	4.7	3.7	1.7
		06	48	4.6	3.8	3.6	2.8	1.2
		07	724	5.8	5.6	5.5	4.5	1.5
		08	739	9.5	8.6	6.4	4.9	2.1
		09	686	7.6	7.1	6.5	5.0	2.0
		10	739	10.9	9.1	8.4	7.2	2.7
		11	714	12.0	11.6	10.7	9.1	3.3
		12	736	13.8	12.5	11.1	10.7	3.3
	ANNUAL		7199	21.6	16.1	15.8	10.7	---
1100 024 G 01 Boyd Park	82	01	733	10.6	10.5	10.5	9.2	2.5
		02	463	13.4	11.3	10.1	8.4	2.5
		03	619	9.0	4.3	3.5	2.0	.6
		04	702	3.4	3.3	3.0	2.2	.7
		05	210	1.4	.9	.9	.7	.1
		06	---	---	---	---	---	---
		07	---	---	---	---	---	---
		08	---	---	---	---	---	---
		09	---	---	---	---	---	---
		10	105	3.8	3.6	3.1	2.0	1.1
		11	705	8.0	8.0	7.6	5.3	1.8
		12	543	9.5	8.0	7.9	6.2	1.5
	ANNUAL		4080	13.4	11.3	10.6	9.2	---

TABLE 34b
AQCR 144 - CARBON MONOXIDE
Parts Per Million

County/City Site Code/Site Name/Location	Yr	Mo	Num Obs	Max Obs	2nd Max	3rd Max	8 Hr Max	Monthly Average
Missoula/Missoula								
1100 024 G 01 Boyd Park	83	01	734	15.1	14.5	13.2	9.3	2.5
		02	578	8.2	8.2	7.6	6.0	1.6
		03	---	---	---	---	---	---
		04	---	---	---	---	---	---
		05	---	---	---	---	---	---
		06	---	---	---	---	---	---
		07	---	---	---	---	---	---
		08	---	---	---	---	---	---
		09	---	---	---	---	---	---
		10	---	---	---	---	---	---
		11	---	---	---	---	---	---
		12	---	---	---	---	---	---
	ANNUAL		1312	15.1	14.5	13.2	9.3	---
1100 024 G 01 Boyd Park	84	01	666	16.5	15.0	14.8	13.3	2.5
		02	692	13.0	12.5	9.5	7.1	1.3
		03	732	9.7	8.0	6.3	3.3	0.3
		04	702	2.1	1.7	1.5	1.3	0.1
		05	737	2.7	2.1	1.6	1.1	0.2
		06	712	1.0	0.9	0.7	0.4	0.2
		07	519	1.1	0.7	0.7	0.2	0.0
		08	616	3.1	2.4	2.3	1.7	0.2
		09	714	3.8	3.6	3.4	2.6	0.5
		10	740	10.4	8.2	6.8	3.7	1.3
		11	710	9.1	8.3	7.3	5.5	1.6
		12	740	10.0	8.7	8.6	6.9	2.1
	ANNUAL		8280	16.5	15.0	14.8	13.3	---
1100 024 G 01 Boyd Park	85	01	733	12.5	11.4	11.0	9.8	1.9
		02	639	11.6	10.8	8.6	7.5	1.8
		03	438	5.3	5.2	5.1	4.0	1.0
		04	443	2.3	2.1	2.0	1.6	0.5
		05	692	2.5	2.4	2.4	1.7	0.6
		06	82	0.1	0.0	0.0	0.0	0.0
		07	---	---	---	---	---	---
		08	---	---	---	---	---	---
		09	---	---	---	---	---	---
		10	---	---	---	---	---	---
		11	---	---	---	---	---	---
		12	710	14.9	12.6	12.0	11.0	2.9
	ANNUAL		3737	14.9	12.6	12.0	11.0	---

TABLE 34c
AQCR 144 - CARBON MONOXIDE
Parts Per Million

County/City Site Code/Site Name/Location	Yr	Mo	Num Obs	Max Obs	2nd Max	3rd Max	8 Hr Max	Monthly Average
Missoula/Missoula								
1100 024 G 01 Boyd Park	86	01	227	11.8	11.4	11.2	8.8	3.1
		02	434	7.7	7.0	6.3	4.8	1.0
		03	736	7.7	6.3	6.0	4.6	0.9
		04	417	2.8	2.5	2.2	1.6	0.8
		05	513	2.3	2.2	1.5	1.1	0.3
		06	---	---	---	---	---	---
		07	---	---	---	---	---	---
		08	---	---	---	---	---	---
		09	---	---	---	---	---	---
		10	591	9.9	9.2	8.8	9.9	1.6
		11	645	9.6	9.4	8.9	6.8	1.3
		12	731	8.8	8.6	8.5	7.3	2.3
	ANNUAL		4294	11.8	11.4	11.2	9.9	---
1100 024 G 01 Boyd Park	87	01	739	22.6	20.9	12.9	10.9	2.3
		02	553	13.8	13.8	11.1	7.5	2.4
		03	509	3.9	3.5	3.2	2.4	0.8
		04	489	5.0	3.9	3.2	2.2	1.0
		05	---	---	---	---	---	---
		06	---	---	---	---	---	---
		07	---	---	---	---	---	---
		08	---	---	---	---	---	---
		09	---	---	---	---	---	---
		10	333	9.0	8.5	8.3	5.2	2.3
		11	714	6.9	6.8	6.6	5.1	1.8
		12	734	8.5	7.7	7.7	6.4	1.6
	ANNUAL		4071	22.6	20.9	13.8	10.9	---

TABLE 35
AQCR 144 - CO - Number of Exceedances
Parts per Million

County/City Site Code	Site Name/Location	Yr	Num Obs	Federal Prim 1-Hr 35	Federal Prim 8-Hr 9	Montana Std 1-Hr 23	Montana Std 8-Hr 9
Missoula/Missoula							
1080 005 G 02	Malfunction Junction	86	5097	0	1	1	1
		87	7199	0	6	0	6
1100 024 G 01	Boyd Park	85	3737	0	3	0	3
		86	4294	0	0	1	0
		87	4071	0	1	0	1

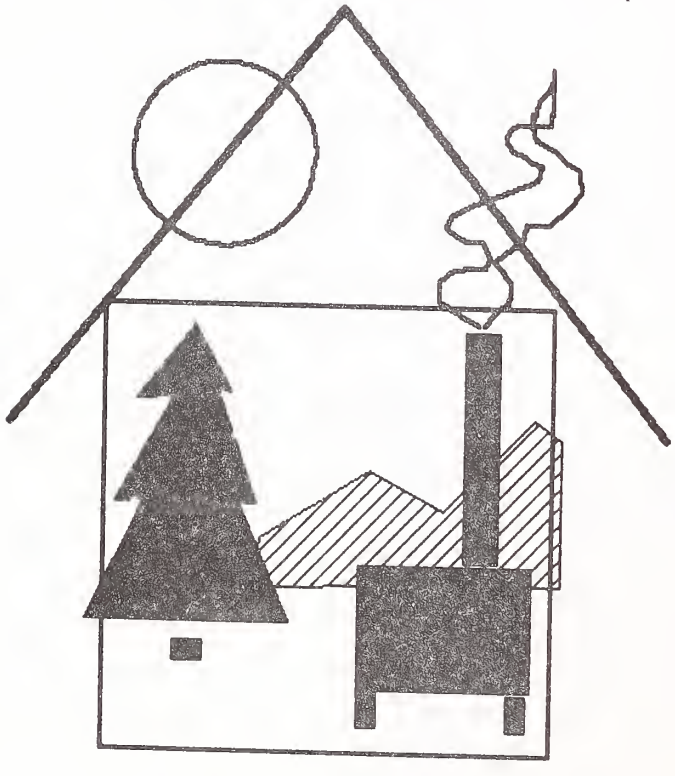


TABLE 36a
AQCR 144 - RESPIRABLE PARTICULATES (PM-10)
Micrograms per Cubic Meter

County/City Site Code/Site Name/Location	Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean	Weighted Annual Average*
Flathead/Columbia Falls							
0270 003 F 01 Columbia Falls Jr. High	85	29	77	76	70	38.5	39.6
	86	56	146	115	108	51.8	52.1
	87	86	186	163	145	53.5	50.6
Flathead/Kalispell							
0800 015 F 01 Universal Athletics	85	20	77	68	68	47.6	46.2
	86	57	260	198	159	61.2	60.9
	87	130	119	105	102	45.2	45.8
Lincoln/Libby							
0900 012 F 01 Lincoln Co. Courthouse	85	26	114	114	98	58.6	58.8
	86	45	171	165	158	76.2	83.7
	87	128	234	226	187	87.5	79.1
0900 012 F 07 Lincoln Co. Crthse. - Collocated	85	31	157	112	98	58.0	58.6
	86	54	322	214	157	86.2	84.8
	87	86	216	214	186	83.6	76.5
Lincoln/Eureka							
0940 005 F 01 Lincoln Elec. Coop.	87	28	102	95	90	48.0	48.0
0940 007 F 05 Kendall Field	87	7	92	73	67	61.7	62.8
Missoula/Missoula							
1100 020 G 01 Rose Park	84	22	142	109	107	51.7	
	85	13	257	135	134	94.0	94.0
	86	321	240	225	216	48.5	48.6
	87	97	276	245	205	59.1	48.8
1100 024 G 01 Boyd Park	84	20	138	127	116	57.3	
	85	5	90	87	76	66.2	66.2
	86	253	238	227	177	45.4	50.6
	87	244	200	162	157	44.1	47.8

TABLE 36b
AQCR 144 - RESPIRABLE PARTICULATES (PM-10)
Micrograms per Cubic Meter

County/City Site Code/Site Name/Location		Yr	Num Obs	Max Obs	2nd Max	3rd Max	Arith Mean	Weighted Annual Average*
Missoula/Missoula								
1100 024 G 07	Boyd Park - Collocated	87	63	153	107	97	41.6	38.0
1100 031 G 01	Health Department	85	24	140	129	126	76.0	76.0
		86	30	143	139	114	59.2	40.3
		87	116	180	169	154	43.9	44.6
1100 033 G 01	Mount Jumbo School	86	4	79	74	71	62.0	62.0
		87	70	106	95	90	38.4	40.3
Ravalli/Hamilton								
1300 001 F 01	Ravalli County Courthouse	86	33	112	96	91	42.5	41.8
		87	39	83	73	69	28.7	29.2
Sanders/Thompson Falls								
1400 003 F 01	Sanders County Courthouse	85	26	89	85	84	48.5	47.4
		86	46	113	113	91	51.4	50.6
		87	75	128	125	105	49.2	47.1

*Data from within a specified sampling period is averaged into one value. These values are then averaged within the quarter. The annual average is derived from the quarterly averages. With this method, additional sampling within a sampling period will not bias the data.

TABLE 37a
AQCR 144 - PM-10 - Number of Exceedances*
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Federal/State Annual Average 50	Federal/State 24-Hour >150
Flathead/Columbia Falls					
0270 003 F 01	Columbia Falls Junior High	85	29	0	0
		86	56	1	0
		87	86	1	2
Flathead/Kalispell					
0800 015 F 01	Universal Athletics	85	20	0	0
		86	57	1	3
		87	130	0	0
Lincoln/Libby					
0900 012 F 01	Lincoln Co. Courthouse	85	26	1	0
		86	45	1	4
		87	128	1	6
0900 012 F 07	Lincoln Co. Crthse. - Collocated	85	31	0	1
		86	54		5
		87	86		7
Lincoln/Eureka					
0940 005 F 01	Lincoln Elec. Coop.	87	28	0	0
0940 007 F 05	Kendall Field	87	7	1	0
Missoula/Missoula					
1100 020 G 01	Rose Park	85	13	1	1
		86	321	0	11
		87	97	0	5
1100 024 G 01	Boyd Park	85	5	1	0
		86	253	1	7
		87	244	0	3
1100 024 G 07	Boyd Park - Collocated	87	63	0	1

TABLE 37b
AQCR 144 - PM-10 - Number of Exceedances*
Micrograms per Cubic Meter

County/City Site Code	Site Name/Location	Yr	Num Obs	Federal/State Annual Average 50	Federal/State 24-Hour >150
Missoula/Missoula					
1100 031 G 01	Health Department	86	30	0	0
		87	116	0	3
1100 033 G 01	Mount Jumbo School	86	4	1	0
		87	70	0	0
Ravalli/Hamilton					
1300 001 F 01	Ravalli County Courthouse	86	33	0	0
		87	39	0	0
Sanders/Thompson Falls					
1400 003 F 01	Sanders County Courthouse	85	26	0	0
		86	46	1	0
		87	75	0	0

*Violations of the PM-10 standards are determined by various criteria, taking into account sampling schedules, data recovery, 3-year averages, etc. An exceedance on this table, therefore, does not necessarily denote a violation of the PM-10 standards.

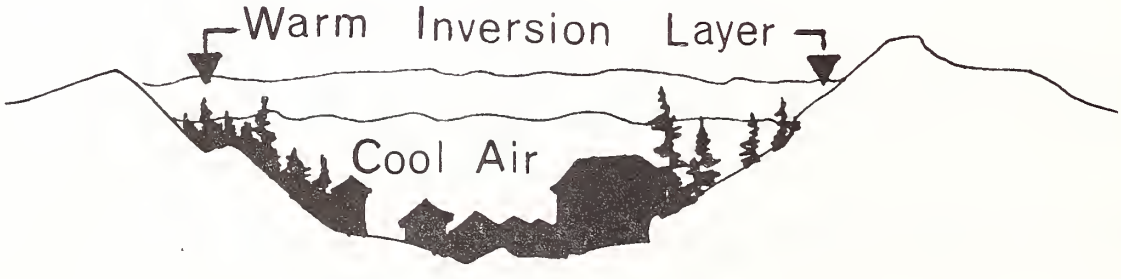
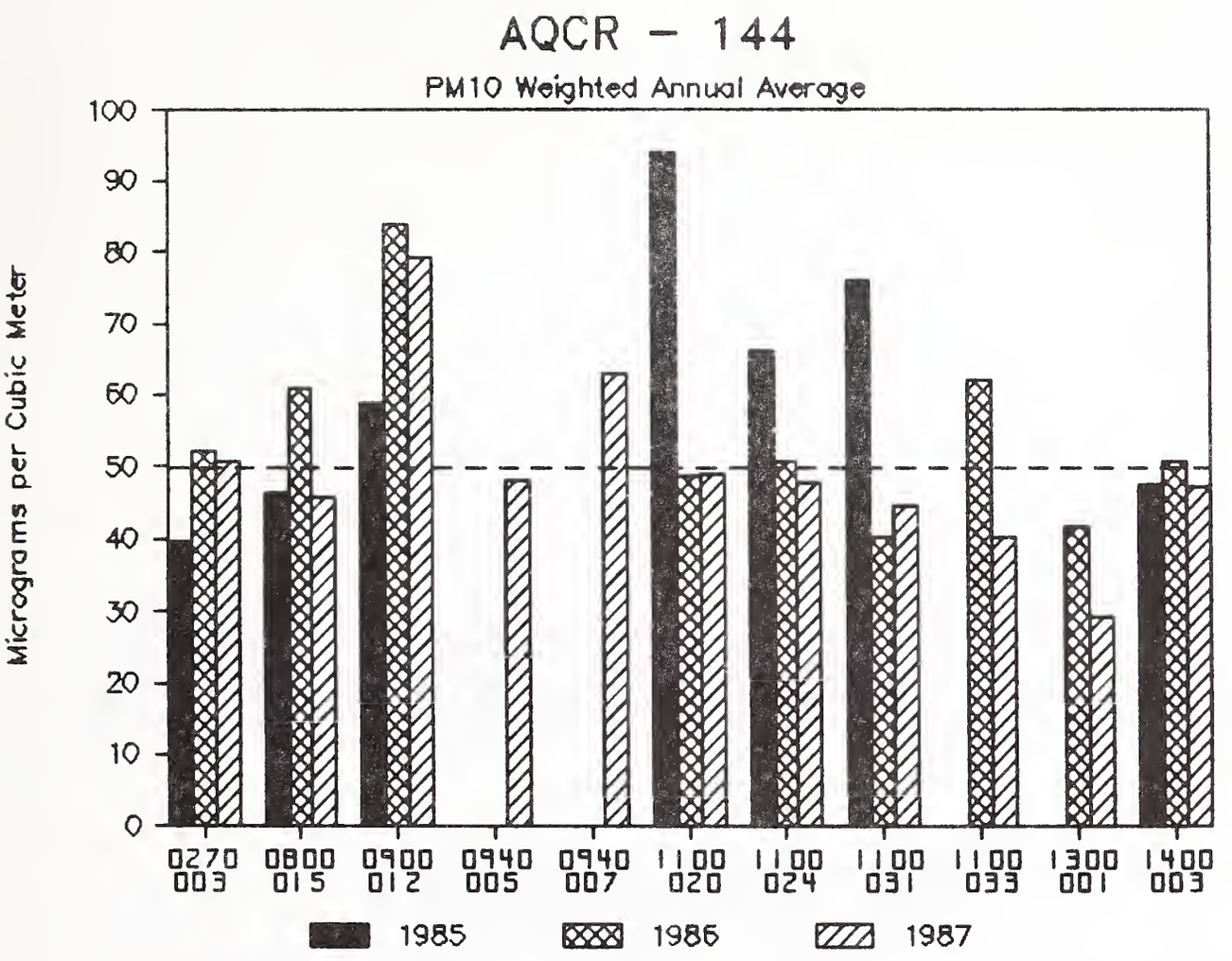


FIGURE 11


AQCR – 144
PM10 Weighted Annual Average
Micrograms per Cubic Meter
100
90
80
70
60
50
40
30
20
10
0
0270 003
0800 015
0900 012
0940 005
0940 007
1100 020
1100 024
1100 031
1100 033
1300 001
1400 003
1985
1986
1987

APPENDIX A

Glossary of Air Quality Terms

APPENDIX A

GLOSSARY OF AIR QUALITY TERMS

ABSORPTION
(Engineering) The process of dissolving a gas or one of a mixture of gases in a liquid.
(Bio-medical) The taking up of fluids or other substances by the skin, mucous surfaces, or absorbent vessels.

ACID MIST
A mist of fine aqueous droplets which contain dissolved acidic compounds, such as sulfuric acid.

ACOUSTIC RADAR
A sounding device used to determine the mixing height.

ADIABATIC LAPSE RATE
The change of temperature with height of a parcel of dry air if it is lifted or lowered, with no loss or gain of heat.

ADSORPTION
The adhesion in an extremely thin layer of the molecules of gases or dissolved substances, or liquids, to the surfaces of bodies with which they are in contact.

AEROSOL
Suspended particulate matter consisting of smoke, dusts, and fumes which are either solid or droplets of liquids. Aerosol particles vary in size from well below one micron to approximately 100 microns in diameter.

AMBIENT AIR
That portion of the atmosphere, external to buildings, to which the general public has access.

AMBIENT AIR QUALITY
A physical and chemical measure of the concentration of various chemicals in the ambient atmosphere. The quality is usually determined over a specific time period.

ANTHRACITE
A type of a coal, hard, with high luster, which contains little volatile matter distinguishing it from bituminous coal.

AROMATIC
In organic chemistry, designating a large class of organic compounds which contain benzene rings. The simplest aromatic compound is benzene.

ASTM

ASTM (American Society for Testing Materials) is a voluntary organization of companies and individuals, established for the purpose of setting up standard methods of testing, so that different individuals can obtain comparable test results upon the same sample. ASTM standard test methods are available for almost all types of materials, including some air pollutants. An ASTM apparatus is the specific apparatus designated by ASTM for a specific test.

ATMOSPHERIC PRESSURE (Also called barometric pressure)

The pressure exerted by the atmosphere as a consequence of gravitational attraction exerted upon the "column" of air lying directly above the point in question. As with any gas, the pressure exerted by the atmosphere is ultimately explainable in terms of bombardment by gas molecules; it is independent of the orientation of the surface on which it acts.

Atmospheric pressure is one of the basic meteorological elements. It is measured by many varieties of barometer, and is expressed in several units. The most common unit used is the millibar (one millibar equals 1000 dynes per cm^2). Unique to the science of meteorology is the use of inches (or millimeters) of mercury; that is, the height of a column of mercury that exactly balances the weight of the column of atmosphere whose base coincides with that of the mercury column. Also employed are units of weight per area and units of force per area. A standard atmosphere has been defined in terms of equivalence to each of the above unit systems, and it is used as a unit itself.

ATTAINMENT AREA

A geographic area in which the quality of the air is better than federal air pollution standards. PSD requirements apply to attainment areas.

ATOMIZING SCRUBBER

A wet collector in which use is made of a liquid medium to increase the size of aerosol particles to facilitate its removal from a gas stream. In an atomizing scrubber, water is introduced at the throat of a venturi through which gas (containing aerosol particles) is moving at high velocity. Units of this type have a high pressure drop, and are used to get high removal efficiencies for particles of relatively small diameters (e.g., below 1.5 microns).

BACT - "Best Available Control Technology"

The term best available control technology means an emission limitation based on the maximum degree of reduction of each pollutant subject to regulation under this Act emitted from or which results from any major emitting facility, which the permitting authority, on a case-by-case basis, taking into account energy, environmental, and economic impacts and other costs, determines is achievable for such facility through application of production processes and available methods, systems and techniques, including fuel cleaning or treatment or innovative fuel combustion techniques for control of each such pollutant. [Clean Air Act, Section 169(3)].

BART - "Best Available Retrofit Technology"

An emission limitation based on the degree of reduction achievable through the application of the best system of continuous emission reduction for each pollutant which is emitted by an existing stationary facility. The emission limitation must be established, on a case-by-case basis, taking into consideration the technology available, the costs of compliance, the energy and nonair quality environmental impacts of compliance, any pollution control equipment in use or in existence at the source, the remaining useful life of the source, and the degree of improvement in visibility which may reasonably be anticipated to result from the use of such technology.

BAGHOUSE

An enclosure containing many cloth bag filters. Dust laden air entering at the top or bottom of a bag is discharged through the cloth directly to the atmosphere while the solid particles are deposited inside the bag.

BITUMINOUS

A type of coal, soft, which yields considerable volatile matter when heated. Burning this type of coal in open fireplaces or household stoves has caused serious air pollution problems (London, formerly in Pittsburgh and Saint Louis) because of the lack of sufficient temperature above the firebed to burn the volatilized gases and tars (i.e., both gaseous and particulate emissions).

BRONCHITIS

Inflammation of the bronchial tubes (wind pipe), which includes the bronchi (s. bronchus) and the choncia (s. bronchium) and through which air passes to the lungs.

BULK DENSITY

The quotient of the total mass of a mixture (usually liquid plus solid or gas plus solid) divided by the total volume.

CARBON DIOXIDE (CO_2)

A colorless, odorless, incombustible gas, used to make carbonated beverages, dry ice, etc. It is a product of respiration, combustion, fermentation, decomposition and other natural processes, and is always present in the atmosphere.

CASCADE IMPACTOR

A device for separating dust particles from a moving air stream. In principle a dust particle collides or impacts on a solid surface and thus is collected while the air stream moves around the solid surface. An assembly of a series of such surfaces is called a cascade impactor.

CHROMATOGRAPHY

A technique used by chemists to cause the separation of small amounts of chemical compounds in order to determine their identity and quantity.

CIRCULATION PATTERN
The general geometric configuration of atmospheric circulation at a given time and region.

CLASS I AREA
Any area which is designated for the most stringent degree of protection from future degradation of air quality. The Clean Air Act designates as mandatory Class I areas each national park over 6,000 acres and each national wilderness area over 5,000 acres.

CLASS II AREA
Any area cleaner than federal air quality standards which is designated for a moderate degree of protection from future air quality degradation. Moderate increases in new pollution may be permitted in a Class II area.

CLASS III AREA
Any area cleaner than federal air quality standards which is designated for a lesser degree of protection from future air quality degradation. Significant increases in new pollution may be permitted in a Class III area.

CLEAN AIR ACT
A law enacted by Congress to protect and enhance the quality of the nation's air resources so as to promote the public health and welfare and the productive capacity of its population.

CRITERIA POLLUTANT
A pollutant for which EPA has established a national ambient air quality standard under Section 109 of the Clean Air Act. Present criteria pollutants are: carbon monoxide, hydrocarbons, lead, nitrogen dioxide, ozone, sulfur dioxide and total suspended particulate.

CLOTH FILTER
A cloth bag filter; see BAGHOUSE

COLLECTION EFFICIENCY
The ratio of the weight fraction of aerosol which is retained in the collector to that which entered the collector. Collection efficiency could be specified in terms of particle numbers or other physical characteristics for special cases.

COMBUSTION
The rapid reaction of carbon containing substances (or other oxygen demanding materials) with oxygen producing a rapid temperature increase and a flame.

COMBUSTION CHAMBER
That part of a furnace or incinerator in which burning takes place.

CONING
A name which describes the approximate shape of a smoke plume in a neutral atmosphere (see FANNING).

CONVECTION
(In meteorology) a mechanical process thermally produced involving the upward and downward transfer of a limited portion of the atmosphere.

CYCLONE COLLECTOR
A device for separating solid particles from gases or liquids. The carrier gas or liquid is made to move in a rapid spiralling motion (cyclonic) throwing the solids by centrifugal force to the walls of the collector.

DEPOSITION VELOCITY
The minimum velocity of a small particle suspended in a moving air stream that will give the particle sufficient momentum to carry it into a target (deposit the particle on a collecting surface). At lower velocities the particle will remain in the air stream and go around the target.

DEW POINT (or dew point temperature)
The temperature to which a given parcel of air must be cooled at constant pressure and constant water vapor content in order for saturation to occur.

DISPERSION
The action of mixing air containing a high concentration of pollutants arising from a pollutant source with the ambient air thereby reducing the ambient pollutant concentration.

DUST COLLECTORS
Any device used to remove particulate matter from exhaust streams.

DUSTFALL
The amount of large particulate matter deposited per unit time per unit area of surface.

ELECTROLYTIC BATH
A container of liquid or molten materials through which an electric current is passed to cause chemical decomposition.

ELECTROSTATIC PRECIPITATOR
A device for collecting dispersed particles. Particle laden air is passed between two surfaces carrying a high electric potential and under the force of the electric field the particles are driven to a collecting electrode and precipitated.

EMPHYSEMA
The presence of air in the alveolar tissue of the lungs due to rupture of the alveoli. Progressive development of this condition leads to enlargement of the lungs and the chest cavity simultaneously with reduced capacity for breathing and efficiency of breathing.

FANNING
The characteristic appearance of a smoke plume emitted under extreme inversion conditions, where little vertical mixing of smoke in the atmosphere takes place (see CONING).

FLUE GASES
All the gases discharged from any stationary combustion process.

FLUE GAS DESULFURIZATION
One of several processes by which sulfur dioxide is removed from the flue gas as a disposal solid, elemental sulfur or sulfuric acid.

FLUORIDE
The generic name of all simple chemical compounds containing fluorine, as sodium fluoride.

FLUORINE
A nonmetallic chemical element, a pale yellow, highly corrosive and toxic gas.

FLUOROSIS
Chronic poisoning by fluorides.

FLY ASH
The non-combustible particles contained in flue gas.

FOSSIL FUELS
Oil, coal or natural gas.

FREE LIFT
The actual lifting force of an inflated balloon, usually expressed in grams. The free lift plus the weight of the balloon and attached equipment is the total lift.

FUME
A fume is formed by sublimation of solid particles from the gaseous state. The term is frequently used to describe suspensions of very small (submicron) particles.

GASIFICATION
The process of converting solid or liquid fossil fuels to gaeous fuel, usually with the elimination of sulfur.

GRAVITY SETTLING
The application of gravitational force to cause solid particles to drop out of the air. Practically it is useful for removing only particles larger than 50 microns in size.

HALOGEN
Any of the five very active, nonmetallic chemical elements: fluorine, chlorine, bromine, iodine, and astatine.

HYDROCARBON

Any of the class of compounds consisting solely of hydrogen and carbon.

1. Paraffins whose molecules contain the maximum possible of hydrogen.
2. Aromatics, whose molecules contain benzene rings.
3. Naphthenes, whose molecules are ring shaped.
4. Olefins, whose molecules contain double bonds.

HYDROFLUORIC ACID

A water solution of hydrogen fluoride. In the gaseous state, hydrogen fluoride is colorless, corrosive, and poisonous.

HYDROGEN

The most simple chemical element and the lightest of all gases. It is found chiefly combined with oxygen to form water; also found in acids, bases, hydrocarbons, etc.

INCINERATORS

Any device to burn solid and combustible liquid residues or wastes in order to reduce their bulk. The ash residue may be used for landfill or dumped at sea. Flue fed incinerators are those where the garbage or refuse is supplied to the combustion chamber through the same flue used for discharge of the products of combustion. A power generating or combination incinerator is one in which the heat from refuse combustion is used to generate steam. Primary air is usually supplied with the material being burned. Secondary air is usually supplied to complete combustion of incompletely burned gaseous fractions over the fuel bed. Tertiary air may be supplied to further improve combustion in a secondary chamber.

INCREMENTS

The amount of additional pollution, beyond already existing background levels, which may be allowed in a particular PSD area. The size of allowable increment varies with whether the area is Class I, Class II or Class III.

INVERSION

A meteorological condition in which the temperature of the atmosphere rises with increased elevation instead of falling; a negative temperature lapse rate.

INVERSION LAYER

A layer in the atmosphere through which the temperature remains constant or increases with altitude.

ICAP - Inductive Coupled Argon Plasma

Measurement of emission spectra which is excited by radiofrequency in a plasma. The emissions from analytes will produce signals on a photomultiplier tube.

INTEGRAL VISTA

A view perceived from within the mandatory Class I Federal area of a specific landmark or panorama located outside the boundary of the mandatory Class I federal area.

ISOKINETIC

Having the same speed and direction. When sampling gas streams for certain purposes it is important that the gas flow into the sampler be of the same speed and direction as the main gas stream. This is called isokinetic sampling.

LAER - Lowest Achievable Emission Rate

A requirement applying to proposed new or modified major stationary sources in nonattainment areas. LAER means the rate of emissions which reflects:

a. The most stringent emission limitation which is contained in the (SIP) of any state for such class or category of source.... or
b. the most stringent emission limitation which is achieved in practice..., whichever is more stringent.

LAPSE RATE

The change in an atmospheric variable, usually temperature, with height.

LIGNITE

A naturally occurring coal-like material often having a distinct woody texture.

MACROMETEOROLOGY

Large-scale weather events as opposed to local micrometeorological events.

MERCAPTAN

One of a class of sulfur-containing organic chemical compounds (R-SH), which have an extremely offensive odor.

METEOROLOGY

The science dealing with the atmosphere and its phenomena, particularly relating to weather.

METHANE

The first of the series of hydrocarbons (CH). It is a colorless, odorless, flammable gas and is the chief constituent of natural gas.

MICROMETEOROLOGY

The science of small-scale weather events.

MICRON (MU)

A metric unit of measure of length equal to one millionth of a meter and to one thousandth of a millimeter. This unit is often used for describing sizes of airborne particles and is commonly designated by the Greek letter μ (mu).

MIXING HEIGHT (or mixing depth)
The thickness of the atmospheric layer, measured from the surface upward, through which pollutants are presumed to mix by virtue of convection caused by daytime heating at the surface. The designation of mixing height implies the existence of an inversion, in which case the mixing height is also the height of the inversion base.

NECROSIS
Gradual decay in trees or plants.

NESHAPS - National Emission Standards for Hazardous Pollutants
EPA has adopted emission standards for sources of asbestos, beryllium, vinyl chloride, and mercury.

NITROGEN OXIDES
Compounds of nitrogen including N_2O, NO, NO_2, NO_3, N_2O_3, N_2O_4, N_2O_5. Those most commonly encountered in the atmosphere are nitrous oxide (N_2O), a normal constituent of the air, and nitric oxide (NO) and nitrogen dioxide (NO_2) which are classified as pollutants.

NONATTAINMENT AREA
A geographic area in which the quality of the air is worse than federal air pollution standards. PSD requirements do not apply in nonattainment areas.

NSPS - New Source Performance Standards
EPA emission standards for certain categories of new or modifed air pollutant sources.

OPACITY
A measurement of visible emissions defined as the degree, expressed in percent, to which emissions reduce the transmission of light and obscure the view of an object in the background.

OXIDANT
Any chemical element or compound which will cause any other element to increase in positive valence in a chemical reaction. Less precisely, any chemical element or compound, e.g. NO_2, including oxygen, which has the same effect as oxygen in a chemical reaction. In photochemical smog, the sum of all compounds detected by reaction with reducing agent, e.g., potassium iodide solution.

OZONE
A form of oxygen, O_3, having three atoms of oxygen to the molecule. It is found in the atmosphere in minute quantities and is a powerful oxidizing agent. It is a toxic constituent of photochemical smog.

PARAFFINS
A class of saturated hydrocarbons characterized by their chain-like molecular structure. See HYDROCARBON.

PARTICLES
Any solid matter emitted by a pollutant source. It is composed of settleable matter (which will settle as dust within a reasonable period of time) and suspended matter (which remains suspended in the atmosphere until washed out by precipitation, deposited by impaction, or some other process).

PARTICULATE MATTER
Finely divided solids or liquids. See AEROSOL.

PHOTOCHEMICAL SMOG
Air pollution resulting from light-induced reaction between certain organic materials and nitrogen dioxide.

PILOT BALLOON
A small balloon whose ascent is followed by a theodolite in order to obtain data for the computation of the speed and direction of winds in the upper air.

PILOT-BALLOON OBSERVATION (Commonly pibal)
An observation method for winds aloft; that is, the determination of wind speeds and directions in the atmosphere above a station. This is done by reading the elevation and azimuth angles of a theodolite while visually tracking a pilot balloon.

The ascension rate of the balloon is approximately determined by careful inflation to a given total lift. After release from the ground, periodic readings (usually at one-minute intervals) of elevation and azimuth angles of the balloon are recorded. These data are transferred to a winds-aloft plotting board, and the wind speed and direction at selected levels are calculated by trigonometric methods.

PREVAILING WIND DIRECTION (or prevailing wind)
The wind direction most frequently observed during a given period. The periods most frequently used are the observational day, month, season and year.

PSD - Prevention of Significant Deterioration
A planning and management process under Sections 160 through 169 of the CAA for allocation and use of air resources.

RADIATION INVERSION
A type of atmospheric inversion occurring usually at night when the earth's surface loses heat by radiation, thus cooling the layer of air next to the ground. See INVERSION.

RESIDUAL FUEL OIL
The remainder after the more valuable petroleum gas, gasoline, lubricants, paraffin waxes and asphalt are removed from petroleum. This heavy oil is used as fuel and is graded number 4, 5, or 6, with the heavier grades bearing higher numbers. These grades are also

cheaper and usually contain more sulfur. The amount of sulfur in the "RESID" depends on the feed stock (source of the crude oil) and the use of dehydrosulfurization processes.

RINGLEMANN CHART
A chart showing four numbered shades of gray as well as pure white and all black, used by visual comparison for estimating the density of smoke as it emerges from a stack. The matched comparison with the chart is referred to as a Ringlemann number.

SCATTERING COEFFICIENT
Amount of back scatter of light due to suspended particulate matter in the air and relates the measurement to visibility and the level of particulates.

SCRUBBER
Any device in which an aerosol is removed from a gas stream by a liquid droplet.

SETTLING CHAMBER
A simple particulate control device which consists of a large expansion in a flue or duct which results in a reduced pollutant velocity and subsequent particulate settling. The settled particulate is then mechanically removed from the chamber.

SETTLING VELOCITY
The speed at which an object will move through its surroundings under the force of gravity.

SIP - State Implementation Plan
A state developed, federally approved plan for implementing and enforcing requirements of the CAA.

SMOG
A combination of smoke and fog, usually generated as a result of atmospheric contamination. London (England) type smog arises as a result of the combined presence of sulfur oxides and particulates in a humid environment. Los Angeles smog or photochemical smog occurs when sunlight generated reactions involving hydrocarbon, ozone and nitrogen oxide take place. The smog is most visible when high concentrations of water vapor occur in the atmosphere simultaneously but may appear as a bluish haze in a dry atmosphere.

SOLAR RADIATION
The total electromagnetic radiation emitted by the sun.

SOOT
Aggregated particles of unburned carbon produced by incomplete combustion. The soot may contain sufficient amounts of sulfur oxides or compounds to damage paint or enamel finishes.

SPRAY CHAMBER
The simplest type of gas scrubber. Gas is passed countercurrent to falling drops of liquid (usually water) from a bank of spray nozzles. A typical appliction is the removal of fly ash and cinders from flue gases.

STABLE
Pertaining to the atmosphere or an atmospheric layer in the condition of static stability, that is, an atmosphere whose temperature lapse rate and moisture distribution is such as to suppress vertical exchange of air.

STAGNATION
With respect to air pollution, the persistence of a given volume of stable air over a region, permitting an abnormal buildup of pollutants from sources within the region.

STATIC STABILITY (Also called hydrostatic stability, vertical stability, convective or convectional stability)
The state of the atmosphere when it is stable relative to vertical displacements. Such an atmosphere tends to remain stratified, in that any air that is displaced vertically is subjected to a buoyant force that tends to restore it to its original level.

Static stability is determined primarily by the temperature lapse rate; an inversion layer is an extreme example of a statically stable layer.

STOICHIOMETRIC
In the exact combining proportions of materials involved in a specific chemical reaction.

SUBSIDENCE INVERSION
An atmospheric inversion due to the downward motion or air, about a stationary high-pressure area with concomitant adiabatic temperature rise. Such an inversion is common to Southern California in the warm months of the year. See INVERSION.

SURFACE INVERSION (or ground inversion)
A temperature inversion based at the earth's surface; that is, an increase of temperature with height beginning at the ground level.

This condition is due primarily to greater loss of heat due to radiation at and near the surface than at levels above. Thus, surface inversions are common over land prior to sunrise and in winter over high-latitude continental interiors.

SYNERGISM
Cooperative action of discrete pollutants such that the total effect is greater than the sum of the two effects taken independently.

TEMPERATURE INVERSION

A layer in which temperature increases with altitude. The principal characteristic of an inversion layer is its marked static stability, so that very little turbulent exchange can occur within it. Strong wind shears often occur across inversion layers, and abrupt changes in concentrations of atmospheric particulates and atmospheric water vapor may be encountered on ascending through the inversion.

When, in meteorological literature and discussion an "inversion" is mentioned, a temperature inversion is usually meant.

THEODOLITE

An optical instrument which consists of a sighting telescope mounted so that it is free to rotate around horizontal and vertical axis and graduated scales so that the angles or rotation may be measured. The telescope is usually fitted with a right-angle prism so that the observer continues to look horizontally into the eyepiece, whatever the variation of the elevation angle. In meteorology, the theodolite is used principally to observe the motion of a pilot balloon.

TOTAL LIFT

The upward force produced by the gas in a balloon. It is equal to the sum of the free lift, the weight of the balloon, and the weight of auxiliary equipment carried by the balloon.

WET COLLECTORS

Dust collectors which operate by contacting the dust with a liquid (usually water). The class includes spray chambers and atomizing scrubbers.

WIND

Air in motion relative to the surface of the earth. Since vertical components of atmospheric motion are relatively small, especially near the surface of the earth, meteorologists use the term to denote almost exclusively the horizontal component. Vertical winds are always identified as such.

WIND ROSE

A diagram showing the wind direction and speed and their variations for a day, a month, or any other specified period of time, for a specific location and altitude.

WIND VANE

An instrument used to indicate wind direction.

APPENDIX B

Ambient Air Quality Standards

APPENDIX B

AMBIENT AIR QUALITY STANDARDS

In December, 1977, the Montana Board of Health and Environmental Sciences directed the Air Quality Bureau to propose an administrative rule containing new enforceable ambient air quality standards.

A set of standards had been on the books for ten years; however, they were considered as goals or guidelines rather than enforceable standards.

It was decided that before new standards were adopted there should be a thorough review to determine whether the old standards were still appropriate or whether scientific research completed since their adoption indicated different standards were necessary.

Subsequently, $147,000 was provided to hire a staff and consultants. This study was called the Montana Ambient Air Quality Standards Study (MAAQS).

As a result of this work a draft environmental impact statement was published in January, 1979; a final statement in February, 1980.

After several public hearings and testimony from numerous "experts", the Board of Health and Environmental Sciences adopted a set of "enforceable" standards in August, 1980. Table AP-B-I lists the Montana and national ambient air quality standards. Additional information about the standards is provided on the following page.

Table AP-B-I

MONTANA AND NATIONAL AIR QUALITY STANDARDS

POLLUTANT	MONTANA STANDARD	FEDERAL PRIMARY STANDARD	FEDERAL SECONDARY STANDARD
Particulate Matter	50 $\mu g/m^3$ expected annual average	50 $\mu g/m^3$ expected annual average	Same as primary standard
10 microns (PM-10)	150 $\mu g/m^3$ expected 24-hr average*	150 $\mu g/m^3$ expected 24-hour average*	Same as primary standard
Sulfur Dioxide	0.02 ppm annual average 0.10 ppm 24-hr average* 0.50 ppm 1-hr average**	0.03 ppm annual average 0.14 ppm 24-hr average*	0.5 ppm 3-24 average*
Carbon Monoxide	9 ppm 8-hr average* 23 ppm hourly average*	9 ppm 8-hr average* 35 ppm 1-hr average*	9 ppm 8-hr average*
Nitrogen Dioxide	0.05 ppm annual average 0.30 ppm hourly average*	0.05 ppm annual average	0.05 ppm annual average
Photochemical Oxidants (ozone)	0.10 hourly average*	0.12 ppm 1-hour average*	0.12 ppm 1-hr average*
Lead	1.5 $\mu g/m^3$ 90-day average	1.5 $\mu g/m^3$ calendar qtr. avg.	None
Foliar Fluoride	35 $\mu g/g$ grazing season avg. 50 $\mu g/g$ monthly average	None	None
Hydrogen Sulfide	0.05 ppm hourly average*	None	None
Settled Particulate (Dustfall)	10 gm/m^2 30-day average	None	None
Visibility	Particle scattering coefficient of 3×10^{-5} per meter annual average***	None	None

$\mu g/m^3$ = micrograms pollutant per cubic meter of sampled air.
ppm = parts pollutant per million parts of sampled air.
*Not to be exceeded more than once per year.
**Not to be exceeded more than 18 times per year.
***Applies to PSD mandatory Class I areas.

Air quality standards have been developed at the national level for six classes of air pollutants and at the state level for nine pollutants plus visibility. Below is a synopsis of each of the pollutants.

Sulfur Dioxide - Sulfur dioxide originates from the burning of fossil fuels such as coal or oil and the smelting of metals ores. The pollutant is known for causing significant loss in crop yield, rusting metals, reducing visibility, and causing irritation of eyes, nose, throat, and lungs.

Particulate Matter - Particulate matter may originate from natural sources such as forest fires and erosion, or result from automobiles, industrial processes, unpaved roads, agriculture, construction, and other human activities. These tiny particles can damage paint, reduce visibility, and carry poisonous chemicals into the lungs causing cellular damage. PM-10 is particulate matter with an aerodynamic diameter of 10 microns or less. It is considered the respirable portion of particulate matter which is most likely to contribute to adverse health effects.

The PM-10 standards are based upon statistical methods which predict values in terms of expected annual averages, expected 24-hour averages, and expected number of exceedances. The expected exceedances are based upon averaging increasing years of data in an attempt to simulate long-term trends in emissions or meteorological conditions.

Carbon Monoxide - Carbon monoxide is a by-product of the incomplete combustion of organic fuels. The most notorious source is the automobile. This odorless gas can, in small amounts, cause headaches, dizziness, fatigue, and slow reactions. It can be especially dangerous for people with heart disease. In larger amounts it can cause death.

Photochemical Oxidants (Ozone) - Photochemical oxidants are produced in the atmosphere when hydrocarbons and nitrogen oxides, combustion wastes from gasoline and other fuels, are exposed to sunlight. Oxidants irritate the eyes, nose, and throat, make breathing difficult, reduce visibility, and damage vegetation.

Hydrocarbons - Hydrocarbons are the unburned chemicals from the combustion or evaporation of organic compounds. Automobile exhaust and uncontained storage of petroleum products are common sources of hydrocarbons. They have been known to cause vegetative damage and contribute to photochemical oxidants.

Nitrogen Oxides - Nitrogen oxides usually originate in high-temperature combustion processes including diesel engines. It is not only a component of photochemical oxidants, but causes an unpleasant smelling brown haze, and is irritating to the nose and throat.

Fluoride - Sources of fluorides include the aluminum, glass, brick, fertilizer and, to a small degree, the oil industries. In excessive amounts, fluorides can cause bone deformities and damage vegetation.

Lead - Lead in the air is generally the result of automobiles and ore smelters. Physical problems of high lead content include gastrointestinal cramps, central nervous system effects, kidney disease, and anemia.

Hydrogen Sulfide - Sources of hydrogen sulfide, the "rotten egg" pollutant include sewage treatment, kraft pulp, and oil industries. The pollutant can damage paint, tarnish copper, injure vegetation, produce a loss of the sense of smell, cause severe respiratory tract irritation, and in large doses, cause death.

Visibility - Visibility reductions are due to the amounts of TSP, aerosols, and gases present in the atmosphere.

APPENDIX C

Point Source Emission Estimates

APPENDIX C

POINT SOURCE EMISSION ESTIMATES - 1987

The following two tables list emission estimates from various industrial sources in the state. Table AP-C-I lists sulfur dioxide emissions; Table AP-C-II lists particulates.

TABLE AP-C-I

POINT SOURCE SULFUR DIOXIDE EMISSION ESTIMATES - 1987

AQCR	Source	SO2 Tons/Yr	County
140	East Decker Coal	23	Big Horn
	Westmoreland Resources	18	Big Horn
	Spring Creek Coal	12	Big Horn
	West Decker Coal	21	Big Horn
	*Western Sugar	261	Yellowstone
	Continental Oil Co. (CONOCO)	3034	Yellowstone
	Farmers' Union CENEX	5121	Yellowstone
	Exxon Co., USA	13016	Yellowstone
	Montana Sulfur	3196	Yellowstone
	Montana Power Co. (Corette)	7238	Yellowstone
141	Montana Refining Co.	273	Cascade
	United Materials	1	Cascade
	Malmstrom AFB	3	Cascade
	*Unocal	192	Glacier
	*Northern Montana Gas	314	Toole
142	*Continental Lime	12	Broadwater
	Pioneer Ready Mix	3	Gallatin
	Plum Creek/Belgrade	1	Gallatin
	Ideal Basic Industries	15	Gallatin
	*Ash Grove Cement West	327	Jefferson
	Golden Sunlight Mine	4	Jefferson
	ASARCO, Inc.	27870	Lewis & Clark
	American Chemet	1	Lewis & Clark
	Helena Sand & Gravel	1	Lewis & Clark
	Park Co. Incinerator	14	Park
	Louisiana Pacific/Deer Lodge	1	Powell
	Stauffer Chemical/Ramsay	1432	Silver Bow
143	ANR Stateline Gas Plant	340	Richland
	Holly Sugar	67	Richland

*Due to varying inspection schedules, some sites were not inspected in 1987. The emissions for these plants reflect 1986 estimates.

TABLE AP-C-I (cont.)

POINT SOURCE SULFUR DIOXIDE EMISSION ESTIMATES - 1987

AQCR	Source	SO2 Tons/Yr	County
143	Montana Dakota Utilities	2231	Richland
	Knife River Coal	2	Richland
	Western Gas Processors	48	Richland
	Peabody Coal	10	Rosebud
	Montana Power Colstrip 1 & 2	4652	Rosebud
	Western Energy Coal	46	Rosebud
	Montana Power Colstrip 3	1375	Rosebud
	Montana Power Colstrip 4	1216	Rosebud
144	American Timber	1	Flathead
	Plum Creek/Evergreen	6	Flathead
	Plum Creek/Columbia Falls	15	Flathead
	Stoltze Land & Lbr./Col. Falls	4	Flathead
	Columbia Falls Aluminum	1775	Flathead
	NUPAC	1	Flathead
	Flathead County Asphalt	1	Flathead
	*Plum Creek/Pablo	11	Lake
	Plum Creek/Ksanka	1	Lincoln
	*Champion/Libby	13	Lincoln
	W. R. Grace	12	Lincoln
	DAW Forest Products	2	Mineral
	Louisiana Pacific Particleboard	1	Missoula
	Champion Intermountain	1	Missoula
	Pyramid Mountain Lumber	3	Missoula
	Stone Container	190	Missoula
	Western Materials	1	Missoula
	Missoula White Pine	2	Missoula
	American Asphalt	2	Missoula
	Jensen Paving Co.	1	Missoula
	Stoltze-Conner Lumber	1	Ravalli
	Darby Lumber	2	Ravalli
	W.I. Forest Products	1	Sanders

*Due to varying inspection schedules, some sites were not inspected in 1987. The emissions for these plants reflect 1986 estimates.

Table AP-C-II

POINT SOURCE PARTICULATE EMISSION ESTIMATES - 1987

TSP Emissions

AQCR	Source	Part. Tons/Yr	County
140	East Decker Coal	685	Big Horn
	Westmoreland Resources	310	Big Horn
	Spring Creek Coal	764	Bighorn
	West Decker Coal	856	Bighorn
	Century Paving	3	Fergus
	Midland O'Leary	18	Yellowstone
	Cereal Foods Processors	220	Yellowstone
	Western Sugar	273	Yellowstone
	Empire Sand & Gravel	3	Yellowstone
	Continental Oil Co. (CONOCO)	169	Yellowstone
	Farmers Union (CENEX)	429	Yellowstone
	Exxon Co. USA	509	Yellowstone
	Montana Power Co./Corette	936	Yellowstone
141	Interstate Specialties	9	Cascade
	General Mills	40	Cascade
	Montana Refining	10	Cascade
	Big Sky Feed & Supply	1	Cascade
	Robinson Insulation	2	Cascade
	Harvest States Coop	28	Cascade
	Great Falls City Asphalt Plant	1	Cascade
	United Materials	8	Cascade
	Conagra Feed	9	Cascade
	Cereal Food Processors	63	Cascade
	GTA Feeds	22	Cascade
	Malmstrom AFB	1	Cascade
142	Stoltze Land and Lumber/Dillon	135	Beaverhead
	Pfizer, Inc.	109	Beaverhead
	*Continental Lime	88	Broadwater
	Western Valley Construction	86	Deer Lodge
	Pioneer Ready Mix	500	Gallatin
	Plum Creek/Belgrade	50	Gallatin
	Ideal Basic Industries	134	Gallatin
	Cyprus Ind. Minerals	63	Gallatin
	Kanta Products	22	Gallatin
	Ash Grove Cement West	1700	Jefferson
	Golden Sunlight Mine	350	Jefferson
	ASARCO, Inc.	356	Lewis & Clark

*Due to varying inspection schedules, some sites were not inspected in 1987. The emissions for these plants reflect 1986 estimates.

Table AP-C-II (cont.)

POINT SOURCE PARTICULATE EMISSION ESTIMATES - 1987

TSP Emissions

AQCR	Source	Part. Tons/Yr	County
142	American Chemet	18	Lewis & Clark
	Helena Sand & Gravel	34	Lewis & Clark
	*Yellowstone Mine - Cyprus	226	Madison
	Montana Talc Co.	124	Madison
	Alcotech Inc.	19	Meagher
	Brand S Lumber	108	Park
	Park County Incinerator	5	Park
	Park Lumber	11	Park
	Cominco	83	Powell
	Louisiana Pacific/Deer Lodge	65	Powell
	Stauffer Chemical/Ramsay	161	Silver Bow
	Butte-Silver Bow Asphalt	3	Silver Bow
	Gilman Excavating	10	Silver Bow
132	Zortman Mining Co.	155	Phillips
	Landusky Mining Co.	258	Phillips
	Holly Sugar	105	Richland
	Montana-Dakota Utilities	154	Richland
	Knife River Coal	135	Richland
	Peabody Coal	504	Rosebud
	Montana Power/Colstrip 1 & 2	1054	Rosebud
	Western Energy	2810	Rosebud
	Montana Power/Colstrip 3	595	Rosebud
	Montana Power/Colstrip 4	689	Rosebud
144	American Timber	132	Flathead
	Plum Creek/Evergreen	494	Flathead
	*Klinger Lumber	15	Flathead
	Plum Creek Lumber/Columbia Falls	418	Flathead
	Stoltze Land & Lumber/Col. Falls	300	Flathead
	Columbia Falls Aluminum	16	Flathead
	NUPAC	54	Flathead
	Flathead County Asphalt	56	Flathead
	*B & J Lumber/Montana Mokko	21	Flathead
	*Flathead Lumber	225	Lake
	*Plum Creek/Pablo	238	Lake
	Owens and Hurst	41	Lincoln
	Plum Creek/Ksanka	27	Lincoln
	ASARCO/Troy	84	Lincoln
	*Champion/Libby	216	Lincoln
	W.R. Grace	2367	Lincoln

*Due to varying inspection schedules, some sites were not inspected in 1987. The emissions for these plants reflect 1986 estimates.

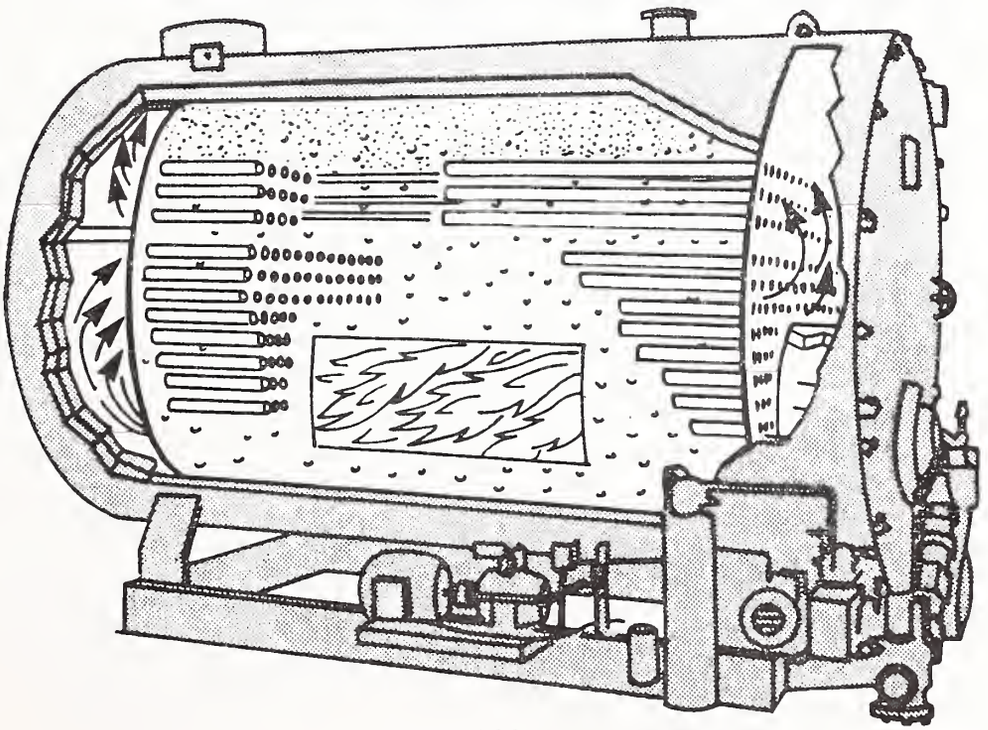
Table AP-C-II (cont.)

POINT SOURCE PARTICULATE EMISSION ESTIMATES - 1987

TSP Emissions

AQCR	Source	Part. Tons/Yr	County
144	DAW Forest Products	35	Mineral
	Northwestern Lumber and Cedar	13	Mineral
	Champion/Bonner	415	Missoula
	Louisiana Pacific - Particleboard	213	Missoula
	Champion/Intermountain	76	Missoula
	Pyramid Mountain Lumber	66	Missoula
	Stone Container	748	Missoula
	Western Materials	18	Missoula
	Missoula White Pine	154	Missoula
	American Asphalt/Missoula Co.	51	Missoula
	Missoula County Asphalt Plant	3	Missoula
	Jensen Paving	115	Missoula
	Stoltze-Conner Lumber	94	Ravalli
	Darby Lumber	33	Ravalli
	Flodin Lumber	119	Sanders
	W. I. Forest Prod. Inc.	159	Sanders
	*Watters Brothers Lumber	4	Sanders

*Due to varying inspection schedules, some sites were not inspected in 1987. The emissions for these plants reflect 1986 estimates.



APPENDIX D

Hi-Vol & PM-10
Sampling Schedules

APPENDIX D

SAMPLING SCHEDULES

High volume samplers (hi-vols) are usually operated on a one-in-six day schedule. In order to meet the needs of data collectors or hi-vol operators, hi-vol schedules for 1988 and 1989 are presented on the following pages.

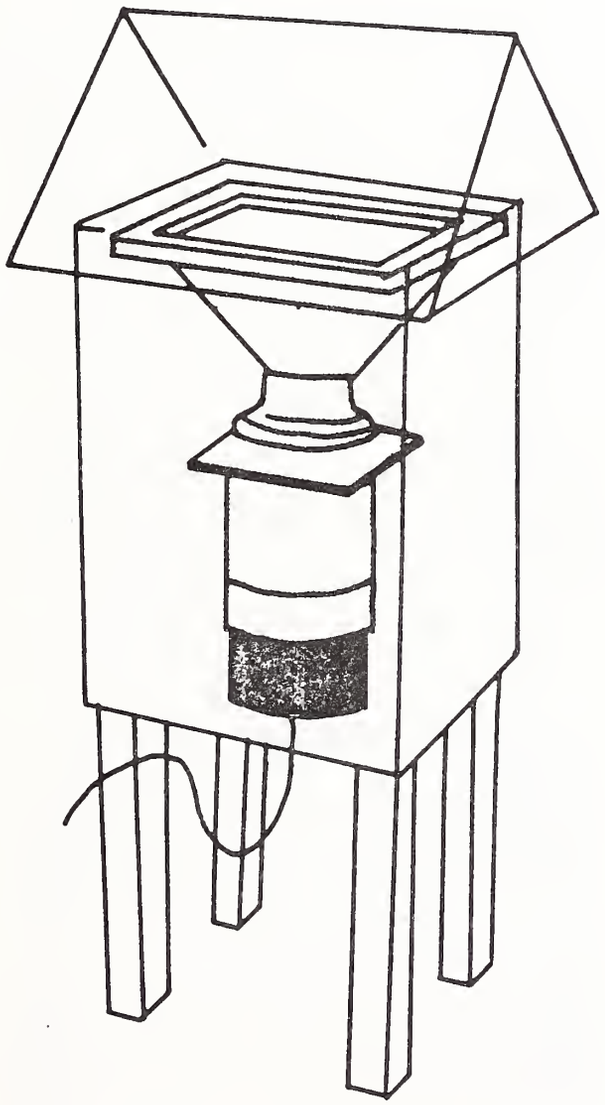


TABLE AP-D-I

1988 SAMPLING SCHEDULE

(Every Sixth Day)

QUARTER 1

January -	February -	March -
4	3	4
10	9	10
16	15	16
22	21	22
28	27	28

QUARTER 2

April -	May -	June -
3	3	2
9	9	8
15	15	14
21	21	20
27	27	26

QUARTER 3

July -	August -	September -
2	1	6
8	7	12
14	13	18
20	19	24
26	25	30
	31	

QUARTER 4

October -	November -	December -
6	5	5
12	11	11
18	17	17
24	23	23
30	29	29

January (1989) -
4
10
16
22
28

NOTE: The sampler should start at midnight, run for 24 hours on the date shown, and be stopped at midnight.

TABLE AP-D-II

1989 SAMPLING SCHEDULE

(Every Sixth Day)

QUARTER 1

January	February	March
4	3	5
10	9	11
16	15	17
22	21	23
28	27	29

QUARTER 2

April	May	June
4	4	3
10	10	9
16	16	15
22	22	21
28	28	27

QUARTER 3

July	August	September
3	2	1
9	8	7
15	14	13
21	20	19
27	26	25

QUARTER 4

October	November	December
1	6	6
7	12	12
13	18	18
19	24	24
25	30	30
31		
January (1990) 5		
11		
17		
23		
29		

NOTE: The sampler should start at midnight, run for 24 hours on the date shown, and be stopped at midnight.

TABLE AP-D-III
PM-10 SAMPLING SCHEDULE

PM-10 sampling schedules are determined according to an area's likelihood of exceeding the PM-10 standards. Every day monitoring is denoted as 1/1; one-in-three day sampling as 1/3; and one-in-six day sampling as 1/6. Schedules may vary from quarter to quarter. The PM-10 sites and their sampling schedules for 1987 are listed below.

Region	Site	Location	1987 Sampling Schedule Q1	Q2	Q3	Q4
AQCR 140	0080 072 G01	Grand Ave., Billings	1/6	1/6	down	down
AQCR 141	0660 017 G01	Downtown, Great Falls	1/6	1/6	1/6	1/6
AQCR 142	0120 002 F01	East Main, Bozeman	1/6	1/6	1/6	1/6
	0720 001 F01	Cogswell Bldg., Helena	1/6	1/6	1/6	1/2
	0720 001 F07	Cogswell Bldg. - Collocated, Helena	1/6	1/6	1/6	1/6
	0860 009 F01	Phillips Lane, Helena	1/6	1/6	down	down
	1260 024 F03	T. Smith Ranch, Ovando	1/6	1/6	down	down
	0160 005 F01	Greeley School, Butte	1/6	1/6	1/6	1/1
AQCR 144	0270 003 F01	Jr. High, Columbia Falls	1/6	1/6	1/6	1/2
	0800 015 F01	Universal Athletics, Kalispell	1/6	1/6	1/6	1/1
	0820 028 K05	Polson Saddle Shop, Polson	1/6	1/6	1/6	1/6
	0900 012 F01	Lincoln Co. Courthouse, Libby	1/6	1/6	1/6	1/1
	0900 012 F07	Lincoln Co. Courthouse, Collocated, Libby	1/6	1/6	1/6	1/2
	0940 005 F01	Lincoln Electric Co-op, Eureka				1/2
	0940 007 F05	Kendall Field, Libby				1/6
	1100 020 G01	Rose Park, Missoula	1/1	down	down	down
	1100 024 G01	Boyd Park, Missoula	1/3	1/1	1/1	1/1
	1100 024 G07	Boyd Park - Collocated		1/3	1/3	1/3
	1100 031 G01	Health Dept. Roof, Missoula	1/3	1/3	1/3	1/3
	1100 033 G01	Mount Jumbo School, Missoula	1/6	1/6	1/3	1/3
	1300 001 F01	Ravalli Co. Courthouse, Hamilton	1/6	1/6	1/6	down
	1400 003 F01	Sanders Co. Courthouse, Thompson Falls	1/6	1/6	1/6	1/2

APPENDIX E

Air Quality Personnel

APPENDIX E

AIR QUALITY PERSONNEL
1988

Air Quality Bureau

(406) 444-3454
(406) 657-2617 (Billings)

Jeffrey T. Chaffee, Chief
John Coefield
Ella Coenenberg (Billings)
Patricia Davidson
Pat Driscoll
Jan Gilman
Kay Hansen
Charles Homer
Jim Hughes (Billings)
Bob Jeffrey
Harry Keltz
Judy Murfitt
Warren Norton
Jim Olsen
Jerry Preszler
Shirley Quick
Bob Raisch
Jerry Schneider
Stan Sternberg

Cascade County Air Pollution Control

(406) 761-1190

William Neilsen
Bruce Treis

Lewis and Clark County

(406) 443-1010

Will Selser
Larry Fenster
Howard Reid

Missoula City-County Health Department

(406) 721-5700

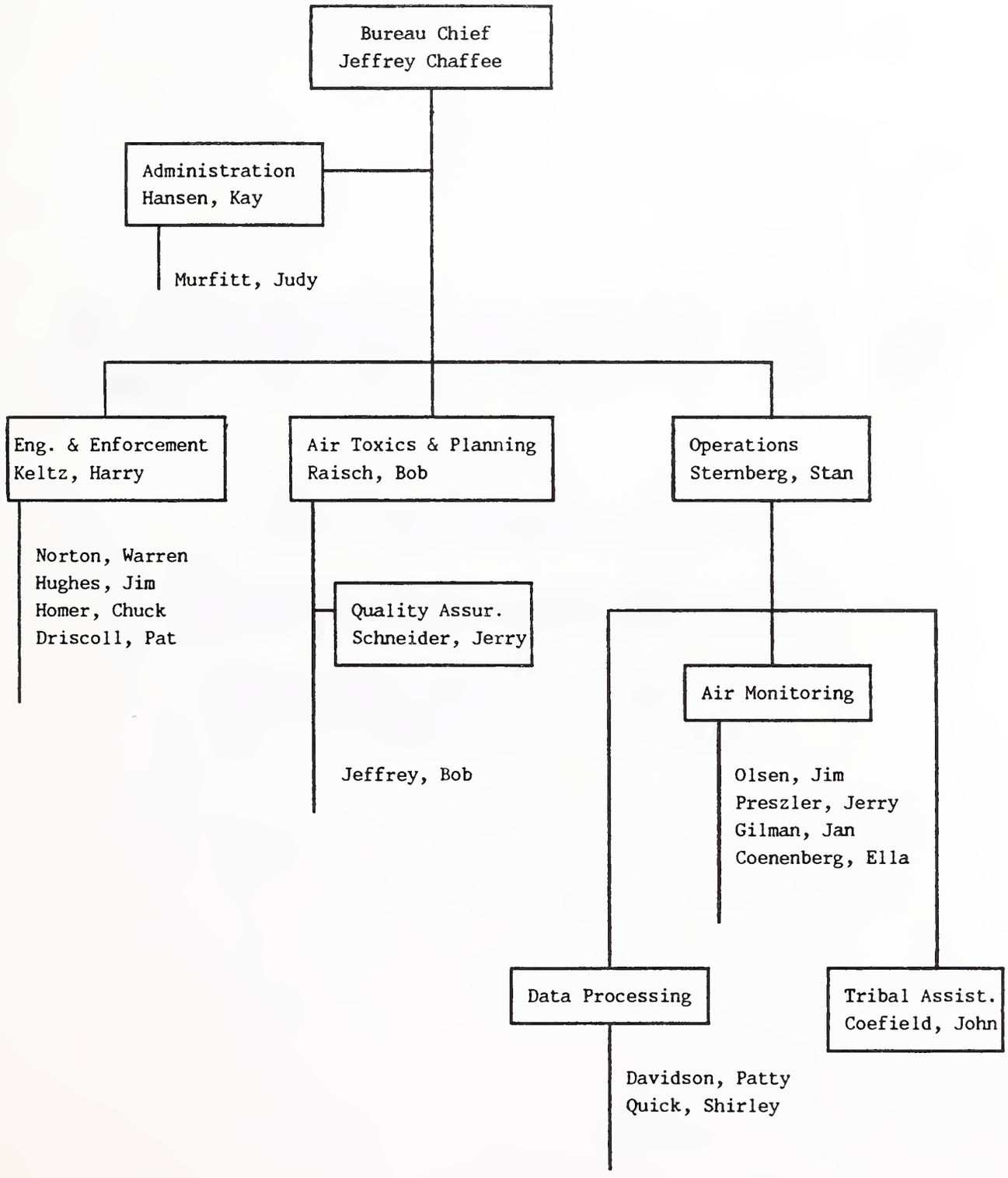
Jim Carlson
Scott Church
Adam Rys-Sikora

Yellowstone County Air Pollution Control

(406) 252-0756

Steve Duganz
Russ Boschee

AIR QUALITY BUREAU



AIR QUALITY BUREAU

Section Responsibilities
2/28/89

Administration Section

A. Budgeting
B. Planning
C. Office Management

Engineering and Enforcement Section

A. Permit Review
B. Inspections
C. Enforcement
D. Smoke Management
E. Open Burning Control
F. Emission Inventory
G. Asbestos Contractor Tracking
H. Complaint Investigations

Operations Section

A. Air Monitoring
B. Equipment Repair/Calibration
C. Dispersion Modeling
D. Data Processing/Computer Services
E. Annual Report and Network Review
F. Tribal Air Program Coordination

Air Toxics and Planning Section

A. Air Toxics Program Development
B. Quality Assurance
C. State Implementation Plans (SO_2, PM-10, Lead and CO)
D. Wood Stoves
E. Non-attainment Studies

APPENDIX F

Attainment Nonattainment Designations

APPENDIX F

ATTAINMENT-NONATTAINMENT DESIGNATIONS

INTRODUCTION

The 1977 Clean Air Act Amendments, enacted by Congress August 7, 1977, contained many new and expanded requirements regarding the control of air pollution. One of the most significant requirements was to classify areas of the state according to whether they met the National Ambient Air Quality Standards (NAAQS). The department classified each area of the state into one of three categories: attainment - meeting the standards, nonattainment - exceeding the standards, or unclassified - insufficient information to determine the status. The areas which were designated nonattainment were required to develop revised State Implementation Plans to control emissions and bring the areas into compliance.

Classification Requirements

Five classifications were possible - three for particulate matter (PM) and sulfur dioxide (SO_2) and two for pollutants other than particulate matter or sulfur dioxide. The five classifications are summarized below.

A) Do not meet a national primary ambient air quality standard for oxidants, carbon monoxide (CO) or nitrogen dioxide (NO_2).

B) Do not meet, or in the judgment of the State will not attain or maintain in the time required by the applicable SIP, any national primary ambient air quality standard for sulfur dioxide or particulate matter.

C) Do not meet a national secondary ambient air quality standard.

D) Cannot be classified as B or C, on the basis of available information, for PM or SO_2.

E) Have ambient air quality levels better than any national primary or secondary ambient air quality standard for oxidants, CO or NO_2, or for which there is insufficient data to be classified A or C.

Areas designated as A, B or C were referred to as nonattainment areas, and areas designated as D or E were referred to as attainment (or unclassified) areas.

Air Quality Data

The department used, whenever possible, the last four consecutive quarters of air quality data to propose the designations. Data was available from two ozone sites, two nitrogen oxides sites, three carbon monoxide sites, eleven sulfur dioxide sites, and fifty total suspended particulate sites.

Designation Proposal

On January 6, 1978, the department submitted to EPA a proposed attainment/nonattainment designation document. The table which follows is a summary of that document. It should be noted that rural areas (less than 50,000 pop.) with high total suspended particulate concentrations were not designated nonattainment if the primary cause of the violations was uncontaminated (non-industrial) fugitive dust.

TABLE AP-F-I

ATTAINMENT STATUS

1. Oxidants

The department proposed that the entire state be unclassified for oxidants.

2. Nitrogen Oxides

	Designation		
Designated Area	107(d)(1)(A) Nonattainment	107(d)(1)(E) Unclassified	107(d)(1)(E) Attainment
Billings, MT area			*
Colstrip, MT			*
Butte, MT		*	
Rest of State		*	

3. Carbon Monoxide

	Designation		
Designated Area	107(d)(1)(A) Nonattainment	107(d)(1)(E) Unclassified	107(d)(1)(E) Attainment
Billings Downtown Area	*		
Butte Area		*	
Colstrip Area		*	
Great Falls		*	
Missoula Area	*		

TABLE AP-F-I (Continued)

ATTAINMENT STATUS

4. Sulfur Dioxide

Designated Area	Designation: Nonattainment 107(d)(1)(B) Primary	107(d)(1)(C) Secondary	107(d)(1)(D) Not B or C
Laurel Area	*		
East Helena Area	*		
Billings			*
Colstrip Area			*
Rest of State			*

5. Total Suspended Particulate

Designated Area	Designation: Nonattainment 107(d)(1)(B) Primary	107(d)(1)(C) Secondary	107(d)(1)(D) Not B or C
Decker			*
Hardin			*
Billings Downtown		*	
Billings Area			*(1)
Great Falls CBD		*	
Great Falls Area			*(2)
Butte Area		*	
Philipsburg			*(1)
East Helena		*	
Three Forks			*(1)(2)
Miles City			*

TABLE AP-F-I (Continued)

ATTAINMENT STATUS

Designated Area	Designation: Nonattainment 107(d)(1)(B) Primary	Designation: Nonattainment 107(d)(1)(C) Secondary	Designation: 107(d)(1)(D) Not B or C
Ekalaka			*(2)
Fort Peck			*
Lame Deer			*
Scobey			*
Glendive			*
Colstrip	*		
Broadus			*(1)
Lindsay			*(1)
Poplar			*
Columbia Falls	*		
Kalispell			*(1)
Libby			*
Troy			*
Missoula Area	*	*	

(1) Violation of standard due to fugitive dust from non-industrial sources - unpaved roads, etc.
(2) Insufficient data from which to classify the area.

Revisions/Considerations of the Original Designation Proposal

Soon after the department submitted its original proposal in 1978, new data indicated other areas were violating standards. In the years that followed, plans and considerations to the original proposal have developed. The following discusses some of the revisions and considerations of the original designation proposal.

Statewide - TSP/PM-10

On July 31, 1987, the Environmental Protection Agency (EPA) promulgated new ambient air quality standards for particulate matter. The new standards changed the focus from larger particles (total suspended particulates - TSP) to smaller inhalable particles known as PM-10 (particles with an aerodynamic diameter less than 10 microns).

As a result of the new standards, parts of Montana which were nonattainment for TSP are now predicted to be in attainment with the new PM-10 standards. On the other hand, some areas will remain nonattainment and a few areas which were attainment for TSP will now be nonattainment for PM-10 standards. Although nonattainment is not the correct legal term to be used in regard to PM-10 and lead, the department uses it here for functional purposes.

After reviewing existing TSP and PM-10 data, the state and EPA have assigned various parts of Montana to one of three categories. Seven communities were identified as Group I areas (likely to violate the standards), six as Group II areas (may violate the standards) and the rest of the state was considered in attainment. Table AP-C-II below identifies the grouping and the corresponding SIP requirements.

TABLE AP-F-II

PM-10 GROUPINGS AND SIP REQUIREMENTS

Grouping	Communities	SIP Requirements
I	Libby, Kalispell, Polson, Ronan, Missoula, Butte and Lame Deer	1. Daily PM-10 monitoring 2. Develop control plan by May 1, 1988 3. Implement control plan within 3 years after EPA approval
II	Eureka, Columbia Falls, Thompson Falls, Anaconda, Helena and Hays	1. Every other day monitoring 2. Commit to determining the compliance status of the area
III	Rest of state	

On April 25, 1988, Montana submitted a committal SIP to EPA that (a) adopted state PM-10 standards identical to the federal standards, (b) repealed the TSP standards, (c) adopted several statewide PM-10 control strategies, (d) incorporated PM-10 into our emergency episode plan, (e) committed to perform the SIP requirements listed in Table AP-C-II, (f) incorporated PM-10 into Montana's new source review and prevention of significant deterioration programs, and (g) requested that EPA redesignate Colstrip, Billings and Great Falls to unclassified for TSP. To date, EPA has not acted on the submittal.

1. Billings - TSP

Billings was designated as non-attainment for total suspended particulates. The TSP plan was approved on March 4, 1980 (45 FR 14036). The secondary standard for TSP is nearing attainment as a result of extensive street sweeping and flushing programs. With the promulgation of the PM10 standards, the department and EPA predict that Billings will be in compliance with particulate standards. Therefore, on April 25, 1988, the department requested that the Billings area be redesignated to unclassified for TSP. As yet, EPA has not responded to the department's request.

2. Billings - CO

Billings was also designated as nonattainment for carbon monoxide. The plan for attainment of the 8-hour CO standard predicted that a modification of the Exposition Drive-First Avenue North intersection would achieve the standards. A proposal to approve the plan appeared on July 23, 1984 (49 FR 29620). Final approval was given on January 16, 1986, (51 FR 2397).

Data collected during the two years following the modification to Exposition Drive (1985-1986) indicates compliance with the standards. Unfortunately, the amount of data collected did not meet completeness requirements and EPA requested that the monitoring site be relocated to a position nearer the road. Therefore, Yellowstone County initiated CO monitoring during the fall of 1988 at a new EPA-approved location. Yellowstone County will also be required to perform a CO emission inventory and perform short-term monitoring in other parts of Billings. If the data indicates compliance, the department will submit a request to redesignate the area to attainment in 1990.

3. Butte - TSP

Soon after the department submitted its proposal, additional data from Butte indicated the area was violating primary standards for total suspended particulates. As a result, EPA immediately promulgated a nonattainment designation for Butte for violation of the primary standard.

The original SIP called for attaining the standard through enforcement of the airborne particulate rule. The Department of Health and Environmental Sciences and Department of Highways were to develop a set of emission factors for paved and unpaved roads and apply these factors to the appropriate streets in the Butte area. As it turned out, the development of these factors proved impossible. The department turned its attention to developing a control plan in conjunction with the Anaconda Minerals Company (ARCO) and the city of Butte.

A plan which called for a permit from ARCO and street paving and sweeping by the City of Butte was developed and approved by the Board of Health. The plan was submitted to EPA in February 1983. EPA has made several inquiries into the plan regarding attainment of the short-term

standard. The state has submitted information showing that the short-term standard was never exceeded in Butte through 1984. EPA indicated that they would only designate the area attainment for the primary standard since the modeling submitted did not show attainment of the secondary standard.

No formal action has been taken in the Federal Register since the department submitted a plan and a request for attainment in 1983. In the meantime, particulate levels in Butte have increased to the point where TSP and PM10 primary standards are once again being exceeded. The department is studying the problem to determine the major emission sources and will submit a PM10 SIP revision in December, 1989

4. Colstrip - TSP

Colstrip was designated as nonattainment for TSP in 1978. The control strategy involved a permit for the nearby coal mines. Such a permit was evaluated and issued according to the plan.

EPA proposed to approve the plan on July 5, 1983, (48 FR 30696) and then again on July 23, 1984, (49 FR 29620). The plan was finally approved on April 26, 1985, (50 FR 16475).

Montana, in cooperation with Montana Power Company, Western Energy Company, and Peabody Coal Company, prepared a redesignation request. The request was submitted to EPA and given final approval on April 26, 1985, (50 FR 16475). The change in status from nonattainment to attainment applies only to the primary standard. The area remains nonattainment for the secondary TSP standard.

With the promulgation of the PM-10 standards, the department and EPA predict that Colstrip will be in compliance with particulate standards. Therefore, on April 25, 1988, the department requested that the area be redesignated to unclassified for TSP. As of this date, EPA has not responded to the department's request.

5. Columbia Falls - TSP

Columbia Falls was designated as non-attainment for total suspended particulates based upon the Anders monitoring site. The control strategy for this area involved the rebuilding of Highway 40 and Nucleus Avenue through Columbia Falls. The paving project for Nucleus was completed in late fall, 1982. Highway 40 was finished in fall, 1984. Data to date does not exhibit a clear pattern. The readings had been dropping as a result of the SIP, but other factors may now be influencing the site.

In July, 1987, the department and EPA designated Columbia Falls as a Group II area for PM10. In September, 1987, every other day PM-10 monitoring was initiated. In October, 1987, PM-10 monitoring showed violations of the new PM-10 standards. Consequently, the department will be conducting studies to identify the major emission sources. Once the sources are determined, a control plan will be developed and submitted to EPA. The department anticipates that the plan will be submitted to EPA by July, 1991.

6. East Helena - TSP

East Helena was designated as a non-attainment area for total suspended particulates based upon the Hastie monitoring site. No special control strategy was implemented since the emission inventory demonstrated over 50% of the particulate emissions were from near-by highway construction In addition, ASARCO agreed to reduce TSP emissions from slag piles by spraying the piles with water or other coating material. The data from Hastie for years 1981-85 indicate compliance with primary and secondary standards. The data for the Hadfield and Firehall sites, however, are slightly higher. These data indicate exceedances of the secondary standard in 1985 and 1986. With the promulgation of the PM-10 standards, the department and EPA predicted that East Helena has a good chance of being in compliance with particulate standards. If PM-10 monitoring verifies this prediction, the department will request that the area be redesignated to unclassified for TSP and attainment for PM-10.

7. East Helena - SO_2

East Helena was designated non-attainment for sulfur dioxide in 1977. The ASARCO smelter installed an acid plant with several modified stacks to reduce the sulfur dioxide emissions. Data for the past six years shows no violations of national or Montana ambient air quality standards.

The department submitted a plan designed to achieve compliance on April 24, 1979. On November 20, 1980 (45 FR 76685), EPA conditionally approved the plan contingent upon the department's demonstrating that the stack represented "good engineering practice." The department submitted the demonstration report on October 18, 1982. Although the department, on October 24, 1983, requested that the area be redesignated to attainment for sulfur dioxide and EPA proposed to approve the plan (7/5/83, 48 FR 30696), final action was not taken due to litigation concerning the federal stack height regulations. As a result of the litigation, the federal stack height rule was revised on July 5, 1985 (50 FR 27892). Montana submitted a revised stack height rule to EPA on March 28, 1986. At this time, EPA has not taken final action on the department's stack height rule or the request for redesignation.

8. East Helena - Lead

EPA promulgated ambient air quality standards for lead on October 5, 1978. The East Helena area was determined to be in violation of the lead standards based on data from the Hastie site.

The department conducted extensive studies to determine the proper source apportionment. Based upon this data, a SIP plan was developed in cooperation with ASARCO, American Chemet, the City of East Helena, and the Montana Department of Highways. The plan was approved by the Board of Health and Environmental Sciences and submitted to EPA on September 29, 1983. EPA gave final approval to the plan on July 9, 1984 (49 FR 27944). The plan required ASARCO to control several fugitive dust sources

including the ore storage piles and roads in and out of the facility. ASARCO also was to install an air control system on the #1 blast furnace and enclose the top of both blast furnaces and ventilate the exhaust to the baghouse. The Montana Highway Department was required to regularly sweep Highway 12 through East Helena.

As of December 31, 1986, all the control strategies in the plan were implemented. Unfortunately, ambient air monitoring data for 1987 and 1988 indicated that lead levels decreased but remained above the lead standard. As a result, EPA notified Montana on October 1, 1988, that the East Helena lead SIP was substantially inadequate. Therefore, Montana is revising the East Helena lead SIP and will submit the document to EPA by October 1, 1989.

9. Great Falls - TSP

The Great Falls area was designated nonattainment of the secondary standard for total suspended particulates. The city has instituted a sweeping/flushing program to control particulate emissions. Data for 1983 indicate compliance with the secondary standard while 1982, 1984, and 1985 show exceedances of the secondary standard. With the promulgation of the PM-10 standards, the department and EPA predict that Great Falls will be in compliance with particulate standards. Therefore, on April 25, 1988, the department requested that the area be redesignated to unclassified for TSP. As of this date, EPA has not responded to the department's request.

10. Great Falls - CO

A corridor along 10th Ave. South was designated as nonattainment for carbon monoxide in September, 1980. The Great Falls City-County Planning Agency was designated as the lead agency to develop a SIP. The plan was developed in conjunction with the Highway Department and Air Quality Bureau. The plan shows that an improvement in automobile emissions as a result of EPA-mandated emission standards and reductions at the Montana Refining Company (formerly Phillips Petroleum Company) will bring the area into compliance by the end of 1985 or 1986. In addition to the improvements in automobiles, the city has completed a number of projects such as improved traffic synchronization, widening of the Warden Street bridge, and a new mass transit system which should assure attainment.

During the review process, it was discovered that emission reductions planned at the Montana Refining Company never occurred. The department discussed this matter with Montana Refining and a compromise solution was worked out. This reduced the base year emissions from 10,000 tons/year to approximately 4,700. The revised plan was approved by the board on March 7, 1986, and subsequently submitted to EPA on March 28, 1986. EPA proposed to approve the plan on January 26, 1987 (52 FR 2732). However, prior to final approval, ambient air monitoring data indicated continuing noncompliance at a monitoring site near 10th Avenue South. As a result, EPA notified Montana on June 17, 1988, that the Great Falls CO SIP was substantially inadequate. Therefore, the department and Cascade County are performing an emission inventory and dispersion model to assist

in developing a revised SIP. Cascade County and the department intend to submit the revised SIP to EPA in December, 1989.

11. Missoula - TSP

The city of Missoula has been designated as nonattainment for total suspended particulates. The city has incorporated a systematic program of street sweeping and flushing to show attainment by 1982. Although not actually part of the plan, Missoula has implemented several control measures directed at emissions from residential wood stoves. The plan was approved by EPA in September 23, 1980 (45 FR 62984). EPA approved a minor revision to the plan (removing two street paving projects) on January 16, 1986. Data to date indicates compliance with the annual TSP standard, but an occasional excursion over the 24-hour standard still occurs.

Ambient air quality data also indicates that Missoula exceeds the new PM-10 standards. The Missoula County Health Department is developing a new PM-10 SIP and expects to submit the plan to the state and EPA by October, 1989.

12. Missoula - CO

Missoula was designated as nonattainment for carbon monoxide based upon a monitoring station near the intersection of Brooks, Russell, and South (Malfunction Junction). A plan was developed which called for the reconstruction of the intersection. This reconstruction was completed in late 1985. The plan was proposed for approval on July 23, 1984 (49 FR 29620) and received final approval on January 16, 1986, (51 FR 2397). EPA's approval notes that the potential exists that areawide sources such as wood stove emissions may be contributing to the problem and this needs to be watched closely in the future.

The Missoula County Health Department continues to monitor CO at two locations and the resulting data indicates ongoing violations of the CO standards. As a result, EPA notified Montana on June 17, 1988, that the Missoula CO SIP was substantially inadequate. Therefore, the department and Missoula County are performing an emission inventory and dispersion model to assist in developing a revised SIP. Missoula County and the department intend to submit the revised SIP to EPA by December, 1989.

13. Laurel/Billings - SO_2

The Laurel area was designated as nonattainment for sulfur dioxide due to readings near the Cenex refinery. Modeling calculations showed potential violations within the Billings area as well. In 1977, a stipulation was signed between the various sulfur dioxide sources and the Department of Health and Environmental Sciences to further study the matter. The stipulation also required some modifications at these sources. An ambient sampling program, as required by the stipulation, was completed in October, 1982. The results of the ambient air quality monitoring indicate compliance with the national standards except for one 3-hour episode in January, 1985. The department has investigated this matter and traced the problem to a malfunction at the Conoco refinery.

The department and the Billings area industries restored SO_2 monitoring in the Billings/Laurel area in 1987 and will continue the effort for the next two years. Based on the results, the department will either submit a revised SIP for Laurel or request a redesignation of the area to attainment for SO_2.

14. Anaconda - SO_2

The Anaconda area was designated nonattainment for sulfur dioxide. The area experienced frequent violations of the ambient air quality standards for sulfur dioxide as a results of the Anaconda Company (ARCO) copper smelter complex. In July, 1980, the smelter temporarily ceased operations as a results of a strike. In September of the same year, Anaconda announced it was permanently ceasing operations at the smelter. As a result of these conditions, the state requested the area be redesignated to attainment. The designation to attainment was made final on July 15, 1982 (47 FR 30762).

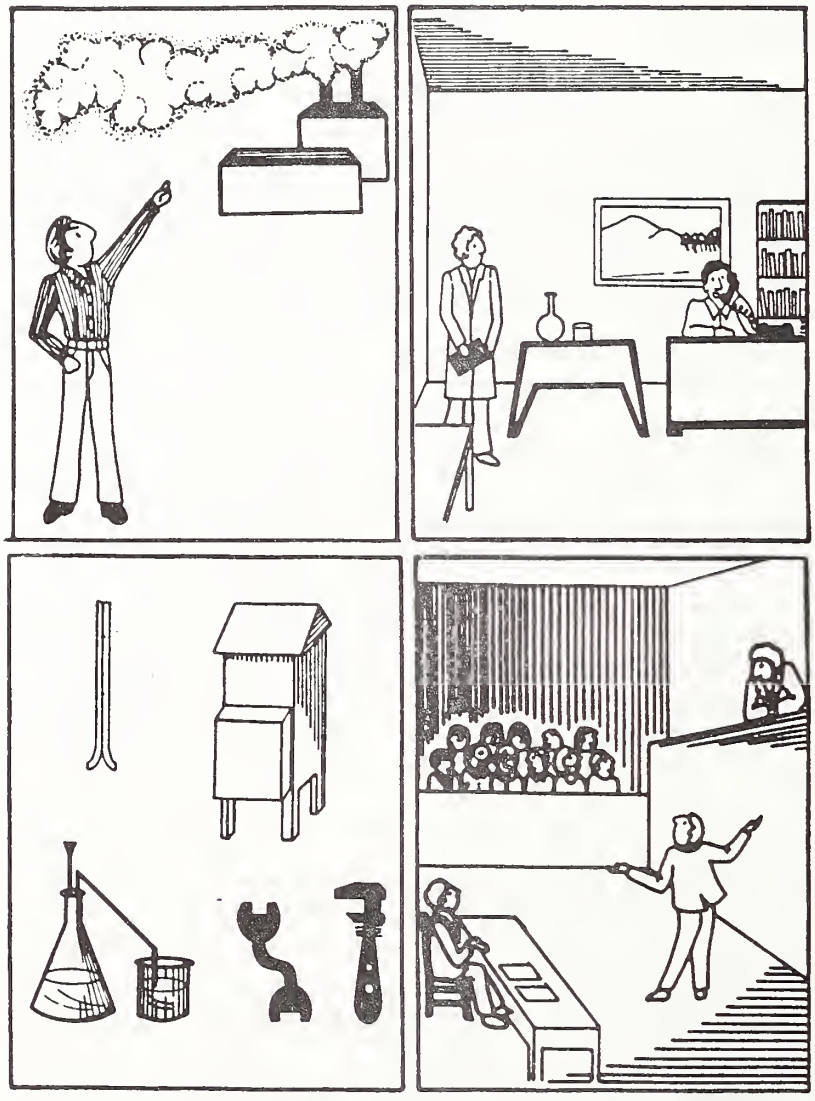
Impacts of Designation

Designation of an area as nonattainment triggers the requirement to develop a control plan to bring the area into compliance. The final compliance date for primary sulfur dioxide and total suspended particulate standards was December 31, 1982. For carbon monoxide and oxidants, the act provided for extensions up to December 31, 1987. Obviously, these dates have passed and Montana still has areas exceeding the standards. Therefore, Montana must revise its control plans and Congress is currently struggling with the long-term noncompliance question.

Although Montana has areas which exceed the PM-10 and lead standards, these areas are not subject to the same requirements of other nonattainment areas. These areas are required to develop control strategies but have three years from the date EPA approves the control plan to comply.

The department developed control plans for each of the nonattainment areas and they are contained in the State Implementation Plan. Many of the plans were modified as more accurate air quality and emissions data became available. Some of the plans such as the East Helena sulfur dioxide plan were carried out with good success. Others were unnecessary due to plant shutdowns as was the case in Anaconda. The plans for carbon monoxide have been followed and are showing progress toward compliance. However, additional controls will be necessary in Missoula and Great Falls. Although plans were developed for particulates, progress has been slow due to expensive and untried control strategies and the need for frequent plan modifications. Nevertheless it appears that compliance with the primary total suspended particulate standard has been achieved in Colstrip and Columbia Falls. In addition, the promulgation of the PM10 standards will remove the TSP nonattainment designation for secondary standards in Colstrip, Great Falls and Billings.

The department is continuing to work on the particulate problem; however, the newly promulgated PM-10 standard may change the appropriate control strategies. Since the PM-10 standard considers only particles less than 10 microns in diameter vs. 40 microns for total suspended particulate, control strategies will need to be directed at sources of fine particulate.



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